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THE PLUM

IN KANSAS,

WITH A CHAPTER ON THE PRUNE.

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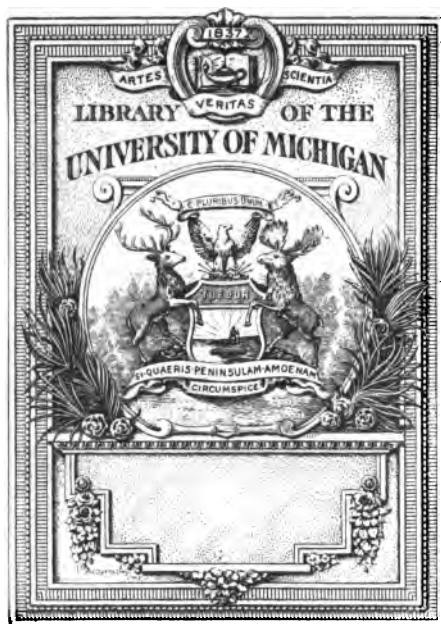
HOW TO GROW THEM.
EVERY LANDOWNER SHOULD GROW SOME.
WHY NOT?

THEY ARE EASILY GROWN.
THEY ARE PROFITABLE.
THEY ARE GOOD TO EAT.



COMPILED AND REVISED FOR THE
KANSAS STATE HORTICULTURAL SOCIETY,
By WILLIAM H. BARNES, SECRETARY,
State Capitol, Topeka, Kan.

ISSUED BY THE STATE,
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TOPEKA, 1900.

THE PLUM.

INTRODUCTORY.

IT should rank fourth on our fruit-tree list. The improvements in this fruit during the last quarter of a century have been as wonderful and progressive as in any horticultural line. The introduction of the Japan plum marked a new era, and the crossing of it upon our natives has resulted in giving us some fine fruits as large as peaches, free from "pucker" or astringency, and of fine grain and flavor—elegant dessert fruits. California has made a great name and market for her plums—mainly hybrid Japan—and while our winters may occasionally play havoc with the plum tree, yet our state can grow as fine plums as any in the union.

Plum trees must be well cultivated and, if necessary, sprayed liberally. Their greatest enemy is the curculio; the jarring process, if persisted in, will conquer the "little Turk." Small plum orchards planted where poultry have a run are quite sure to produce abundant crops. Our horticulturists mostly plant the Wild Goose; this, to do well, should have a potent consort or fertilizer, like Robinson, Pottawatomie, or others. Our sixty or seventy correspondents differ in a few minor points. One declares that our native plums always grow in thickets; therefore he planted his plum orchard that way; another planted three trees in each hole; some plant only ten feet apart; others eighteen to twenty feet. We have inserted many articles showing profit in plums. We have also added quite a number of articles showing up one or more varieties in a special light, proving their particular value in favored localities. As we have inserted matter from many states in the far East, the South, the far West, and the North, our horticulturists should study all the special conditions of climate and location, and not plant blindly, thinking success lies entirely with the variety. Climate, soil, location, cultivation, thinning, each has a bearing as well as has variety.

This work is not issued as an infallible guide, or "how to get rich growing plums in Kansas," but to start a line of thought among a thinking people; although an occasional chance here and there may be unsuccessful, yet to our state as a whole it may and surely will be a grand success. Our state pays for this work in the hope that it may result in giving an impetus to the plum industry.

SECRETARY.

WHAT IS A PLUM?

DEFINITION IN THE STANDARD DICTIONARY: The edible drupaceous fruit of the *Prunus domestica*, and of several other species of *Prunus*; also, the tree itself, usually called plum tree. The Bullace, the Damson, and the numerous varieties of plum of our gardens, although growing into thornless trees, are believed to be varieties of the blackthorn, produced by long cultivation. Two or three hundred varieties of plums derived from the *P. domestica* are described; among them the Green Gage, the Orleans, the Damson, the Purple Gage or Reine Claude Violette and the German Prune are some of the best known.

Among true plums are the Beach plum (*P. maritima*) and its crimson or purple globular drupes. Bullace plum. Chickasaw plum, the American *P. chicasa* and its round-headed drupes. Orleans plum, a dark-reddish plum of medium size, much grown in England for sale in the markets. The wild plum of America (*P. americana*), with red or yellow fruit—the original of the Iowa plum—and several other varieties.

Among plants called plum, but of other genera than *Prunus*, are the Australian plum (*Cargillia arborea* and *C. australis*), of the same family with the persimmon. Blood plum, the West African *Hæmatostaphes barteri*. Cocoa plum, the Spanish nectarine. Date plum. Gingerbread plum, the West African *Parinarium macrophyllum*. Gopher plum, the Ogeechee lime. Gray plum. Guinea plum. Indian plum, several species of *Flacourtia*.

DEFINITION IN THE CENTURY ENCYCLOPÆDIC DICTIONARY: (1) A fruit of any of the trees called plums; specifically, the fruit of the tree of the genus *Prunus*, distinguished from the peach and apricot by its smooth surface, smaller size, and unwrinkled stone, and from the cherry by the bloom on its surface and commonly larger size. Plums are of use chiefly as a domestic fruit (the Green Gage being esteemed the best of all varieties), and as a dried fruit in the form of prunes. Locally a liquor is manufactured from them, and sometimes an oil is expressed from the kernels.

(2) One of several small fruits of the genus *Prunus*, forming the section *Prunus* proper. The numerous varieties of the common garden plum are often classed as *P. domestica*; but all these, together with the Bullace plum, known as *P. insititia*, are believed to be derived ultimately from *P. spinosa* (*P. communis*), the blackthorn or sloe of Europe and temperate Asia, in its truly wild state a much-

branched shrub, the branches often ending in a stout thorn. Plum wood is useful in cabinet-work and turnery. The plum is chiefly cultivated in France (in the valley of Loire), in Germany, and in Bosnia, Servia, and Croatia. In America the plum suffers greatly from the ravages of the curculio. The Japanese plum (*P. japonica*), though not insect proof, is a valued acquisition in California and the southern United States.

Cherry plum: A cherry-like form of the common plum, the variety *P. myrobalana*. Also called Myrobalan plum.

Wild plum: Any undomesticated plum. Specially (a) the *P. spinosa*. (b) In eastern North America, the wild yellow or red plum, or Canada plum, *P. americana*; it has a well-colored fruit, with a pleasant pulp, but tough acerb skin; is common along streams, and sometimes planted. (c) In western North America, *P. subcordata*, whose red fruit, which is large and edible, is often gathered. (d) In South America, *Pappea capensis*. (e) In New South Wales, a tree, *Sideroxylon australis*, with drupaceous fruit, some very tall, having a hard, pretty marked wood, available for cabinet purposes.

PLUMS IN GENERAL.

From Thomas's "American Fruit Culturist."

In no branch of pomology has greater progress been made the past twenty years than in the improvement and development of our native plums and in the introduction of foreign varieties. The bringing in of the Japanese plums marks an era in fruit culture in the United States.

PROPAGATION: Seedlings.—As with most fruits, plums rarely come true from seed, although some varieties vary but little from the parent stock. The stones should be selected from the choicest kinds, and treated in planting precisely as directed for the peach, but greater care must be exercised to prevent their drying, which occurs much in consequence of their smaller size and thinner skin. It is better to crack them, without which many will not vegetate the first year.—**Stocks.**—The stocks heretofore used for growing plums have generally been seedlings of the domestic type (especially the Myrobalan, or Cherry plum), which, when the varieties of the European plums do well, are usually satisfactory, although upon light or unfavorable soils they are apt to produce feeble and slow growing seedlings. For the Southern states the Chickasaw stock is preferable, and in the Northern states and throughout the country generally seedlings of the best of the *americana* group, in consequence of their greater hardiness, are

most desirable of all. Peach stocks, used in the past to some extent, are now seldom propagated upon. All trees grown on Chickasaw stock are inclined to sucker. Plums of the *domestica* group grafted upon native stocks are said to grow so poorly as to overtop the stock, and become liable to injury from strong winds.

GRAFTING AND BUDDING: Crown grafting is recommended by most of the experiment stations. The scions should be cut in the fall, three or four buds to each. Put in the scions early in the spring, before there are any signs of the buds starting. Budding must be done while the stocks are at the period of their most vigorous growth, provided sufficiently matured buds can be found, which is usually soon after midsummer. If deferred, the bark will not peel freely and the buds will not adhere.

CULTIVATION: The best soil, usually, is a strong, rich, clayey loam. On many light soils the tree grows with less vigor, independently of which the crop is more frequently destroyed by the curculio, a previous soil affording a more ready place of shelter for the young insects on their escape from the fallen fruit. A few varieties are well adapted to rather dry as well as light lands. Applications of potash and ground bone, as usual with other fruits, is of advantage in increasing the fruitfulness of the plum. In planting orchards a suitable distance is one rod apart, giving 160 trees to the acre. The ground should be manured and kept well cultivated, as the plum, especially when young, is sensitive to the effects of the weeds and grass of neglected culture.

IMPOTENCY: It is well known that some of the native varieties are so deficient in fertile pollen that they are almost incapable of fertilizing themselves. It is therefore advised that trees of the *domestica* class be planted with them, mixing them in the rows or groups.

CLASSIFICATION: With but comparatively few exceptions the varieties of plums grown in gardens and for commercial purposes may be included in five groups. As this work aims to be of a practical rather than scientific character, these only will be considered. They are:

1. The *americana* group (*P. americana*). Comprises a class of hardy, vigorous young trees, the wild forms of which are found growing throughout the Northern states. The fruits differ widely in all their characteristics.

2. The Wild Goose group (*P. hortulana*). This class has heretofore been included in the *americana*, but it has recently been separated by Professor Bailey into an independent group, and includes the Miner type.

3. The Chickasaw group (*P. angustifolia*). It is found growing wild in the Southern states.

4. The European group (*P. domestica*). Most of the finest plums which have been cultivated in the United States until quite recently belong to this class. They are all of European or Asiatic origin. Except in certain localities, they are invaluable. The Myrobalan and Marianna plums, which belong to this group, are largely used for stocks.

5. The Japanese plums (*P. triflora*). These fruits were imported into the United States about twenty-five years ago, and have grown steadily in popularity. They are generally of large size, brilliantly colored, and excellent in quality. Many seedlings and hybrids from this stock are being introduced. They are not all equally adapted for all sections of the country. Some are not hardy North, some bloom too early, and others do not do so well in the Southern states as farther north.

THE PLUM (*Prunus domestica*).

Rosaceæ, of botanists. *Prunier*, of the French; *Pflaumenbaum*, German; *Prugno*, Italian; *Ciruelo*, Spanish.

The original parent of most of the cultivated plums of our gardens is a native of Asia and the southern parts of Europe, but it has become naturalized in this country, and in many parts of it is produced in greatest abundance.* That the soil and climate of the Middle states are admirably suited to this fruit is sufficiently proved by the almost spontaneous production of such varieties as the Washington, Jefferson, Lawrence's Favorite, etc.; sorts which equal or surpass in beauty or flavor the most celebrated plums of France or England.

USES: The finer kinds of plums are beautiful dessert fruits, of rich and luscious flavor. They are not, perhaps, so entirely wholesome as

* There are three species of wild plum indigenous to this country of tolerable flavor, but seldom cultivated in our gardens. They are the following:

1. The Chickasaw plum (*P. chicasa* Michaux). Fruit about three-fourths of an inch in diameter, round, and red or yellowish red, of a pleasant, subacid flavor, ripens pretty early. Skin thin. The branches are thorny, the head rather bushy, with narrow lanceolate, serrulate leaves, looking at a little distance somewhat like those of a peach tree. It usually grows about twelve or fourteen feet high; but on the prairies of Arkansas it is only three or four feet high, and in this form it is also common in Texas. The Dwarf Texas plum, described by Kenrick, is only this species. It is quite ornamental.

2. Wild red or yellow plum (*P. americana* Marshall). Fruit roundish oval, skin thick, reddish orange, with a juicy, yellow, subacid pulp. The leaves are ovate, coarsely serrate, and the old branches rough and somewhat thorny. Grows in hedges and by the banks of streams from Canada to the Gulf of Mexico. Tree from ten to fifteen feet high. Fruit ripens in July and August.

3. The Beach plum or Sand plum (*P. maritima* Wang). A low shrub, with stout straggling branches, found mostly on the sandy seacoast, from Massachusetts to Virginia, and seldom ripening well elsewhere. Fruit roundish, scarcely an inch in diameter, red or purple, covered with a bloom. Pleasant, but somewhat astringent. Leaves oval, finely serrate.

the peach and the pear, as, from their somewhat cloying and flatulent nature, unless when very perfectly ripe, they are more likely to disagree with weak stomachs. For the kitchen, the plum is also very highly esteemed, being prized for tarts, pies, canning, sweetmeats, etc. In the south of France an excellent spirit is made from this fruit fermented with honey. In the western part of New York, where they are very abundant, they are halved, stoned and dried in the sun or ovens in large quantities, and are then excellent for winter use. For eating, the plum should be allowed to hang on the tree till perfectly ripe, and the fruit will always be finer in proportion as the tree has a more sunny exposure. The size and quality of the fruit is always greatly improved by thinning the fruit when it is half grown. Indeed, to prevent rotting, and to have this fruit in its highest perfection, no two plums should be allowed to touch each other while growing, and those who thus thin them are amply repaid by the superior quality of the fruit.

One of the most important forms of the plum in common is that of prunes, as they are exported from France to every part of the world. We quote the following interesting account of the best mode of preparing prunes from the Arboretum Britannicum :

The best prunes are made near Tours, of the St. Catherine plum and the Prune d'Agen; and the best French plums (so called in England) are made in Provence, of the Perdrigon Blanc, the Brignole, and the Prune d'Ast; the Provence plums being the most fleshy and having always most bloom. Both kinds are, however, made of these and other kinds of plums in various parts of France. The plums are gathered when just ripe enough to fall from the trees on their being slightly shaken. They are then laid separately on forms or sieves made of wickerwork or lath, and exposed for several days to the sun, till they become as soft as ripe medlars. When this is the case they are put into a spent oven, shut quite close, and left there for twenty-four hours; they are then taken out and, the oven being slightly reheated, they are again put in when it is rather warmer than it was before. The next day they are taken out and turned by slightly shaking the sieves. The oven is again heated, and they are put in a third time when the oven is one-fourth degree hotter than it was the second time. After remaining twenty-four hours they are taken out and left to get quite cold. They are then rounded, an operation which is performed by turning the stone in the plum without breaking the skin and pressing the two ends together between the thumb and finger. They are again put upon the sieves, which are placed in an oven from which the bread has just been drawn. The doors of the oven are closed, and crevices are stopped around it with clay or dry grass. An



hour afterward the plums are taken out and the oven is again shut with a cup of water in it for about two hours. When the water is so warm as just to be able to bear the finger in it, the prunes are again placed in the oven and left there for twenty-four hours, when the operation is finished, and they are put loosely into small, long and rather deep boxes for sale. The common sorts are gathered by shaking the trees; but the finer kinds, for making French prunes, must be gathered in the morning, before the rising of the sun, by taking hold of the stalk between the finger and thumb, without touching the fruit, which is laid gently on a bed of vine leaves in a basket. When the baskets are filled without the plums touching each other, they are removed to the fruit room, where they are left for two or three days exposed to the sun and air, after which the same process is employed as for the others, and in that way the delicate bloom is retained on the fruit even when quite dry.

PROPAGATION AND CULTURE: The plum is usually propagated in this country by sowing the seeds of any free-growing variety (avoiding the Damsons, which are not readily worked), and budding them, when two years old, with finer sorts. The stones should be planted as soon as gathered, in broad drills (as in planting peas), but about an inch and a half deeper. In good soil the seedlings will reach eighteen inches or two feet in height the next season, and in the autumn or the ensuing spring they may be taken from the seed-bed, their tap-roots reduced, and all that are of suitable size planted at once in the nursery rows, the smaller ones being thickly bedded until after another season's growth. The stocks planted out in the nursery will ordinarily be ready for working the ensuing midsummer, and, as the plum is quite difficult to bud in this dry climate if the exact season is not chosen, the budder must watch the condition of the trees and insert his buds as early as they are sufficiently firm, say, in this neighborhood, about the 10th of July. Insert the buds, if possible, on the north side of the stock, that being more protected from sun, and tie the bandage rather more tightly than for other trees. The English propagate very largely, by layers, three varieties of the common plum—the Muscle, the Brussels, and the Pear plum, which are almost exclusively employed for stocks with them. But we have not found these stocks superior to the seedlings raised from our common plums (the Blue Gage, Horse plum, etc.) so abundant in all our gardens. For dwarfing, the seedlings of the Mirabelle are chiefly employed. Open-standard culture is the universal mode in America, as the plum is one of the hardiest of fruit-trees. It requires little or no pruning beyond that of thinning out a crowded head or taking away decayed or broken branches, and this should be done before

midsummer, to prevent the flow of gum. Old trees that have become barren may be renovated by heading them in pretty severely, covering the wounds with a solution of gum shellac, and giving them a good top-dressing at the roots.

SOIL: The plum will grow vigorously in almost every part of this country, but it only bears its finest and most abundant crops in heavy loams or in soils in which there is a considerable mixture of clay. In sandy soil the tree blossoms and sets plentiful crops, but they are rarely perfected, falling a prey to the curculio, an insect that harbors in the soil and seems to find it difficult to penetrate or live in one of a heavy texture, while a warm, light, sandy soil is exceedingly favorable to its propagation. It is also undoubtedly true that a heavy soil is naturally the most favorable one. The surprising facility with which superior new varieties are raised merely by ordinary reproduction from seed in certain parts of the valley of the Hudson, as at Hudson or near Albany, where the soil is quite clayey, and also the delicious flavor and great productiveness and health of the plum tree there, almost without any care, while in adjacent districts on rich sandy land it is a very uncertain bearer, are very convincing proofs of the great importance of clayey soil for this fruit.* When the whole soil of a place is light and sandy, we would recommend the employment of pure yellow loam or yellow clay in place of manure when preparing the border or spaces for planting the plum. Very heavy clay, burned slowly by mixing in large heaps with brush or fagots, is, at once, an admirable manure and alternative for such soils. Swamp muck is also one of the best substances, and especially that from salt-water marshes. Common salt we have found one of the best fertilizers for the plum tree. It generally promotes its health and luxuriance.

INSECTS AND DISEASES: There are but two drawbacks to the cultivation of the plum in the United States, but they are in some districts so great as almost to destroy the value of this tree. These are the curculio and the knots. The curculio, or plum-weevil (*Rhynchænus nenuphar*), is the uncompromising foe of all smooth-stone fruits. The cultivator of the plum, the nectarine, and the apricot, in many parts of the country, after a flattering profusion of snowy blossoms and an abundant promise in the thickly set young crops of fruit, has the frequent mortification of seeing nearly all, or indeed, often, the whole crop, fall from the trees when half or two-thirds grown. If he examines these fallen fruits he will perceive on the surface of each, not far from the stalk, a small semicircular scar. This scar is the

* When this was written it was generally supposed that the curculio would not attack the fruit of plums growing on trees in clayey soil, but practical experience has shown that such is not the fact.—REVISER.

crescent-shaped insignia of that "little Turk," the curculio, an insect so small as, perhaps, to have escaped his observation for years, unless particularly drawn to it, but which, nevertheless, appropriates to himself the whole product of a tree, or an orchard of a thousand trees. The habits of this curculio, or plum-weevil, are not yet fully and entirely ascertained. But careful observation has resulted in establishing the following points in its history:

The plum-weevil is a small, dark-brown beetle, with spots of white, yellow, and black. Its length is scarcely one-fifth of an inch. On its back are two black humps, and it is furnished with a pretty long, curved throat and snout, which, when it is at rest, is bent between the fore legs. It is also provided with two wings, with which it flies through the air. How far this insect flies is yet a disputed point, some cultivators affirming that it scarcely goes farther than a single tree, and other believe that it flies over a whole neighborhood. Our own observation inclines us to the belief that this insect emigrates just in proportion as it finds in more or less abundance the tender fruit for depositing its eggs. Very rarely do we see more than one puncture in a plum, and, if the insects are abundant, the trees of a single spot will not afford a sufficient number for the purpose; then there is little doubt (as we have seen them flying through the air) that the insect flies farther in search of a larger supply. But usually, we think, it remains nearly in the same neighborhood, or migrates but slowly. About a week or two after the blossoms have fallen from the trees, if we examine the fruit of the plum in a district where this insect abounds, we shall find the small, newly formed fruit beginning to be punctured by the proboscis of the plum-weevil. The insect is so small and shy that, unless we watch closely, it is very likely to escape our notice. But if we strike or shake the tree suddenly, it will fall in considerable numbers on the ground, drawn up as if dead, and resembling a small raisin, or, perhaps more nearly, a ripe hempseed.

From the 1st of April until August this insect may be found, though we think its depredations on fruit, and indeed its appearance in any quantity, are confined to the months of May and June in this climate. In places where it is very abundant, it also attacks, to some extent, the cherry, the peach, and even the apple and pear. Early in July the punctured plums begin to fall rapidly from the tree. The egg deposited in each, at first invisible, has become a white grub or larva, which slowly eats its way toward the stone or pit. As soon as it reaches this point the fruit falls to the ground. Here, if left undisturbed, the grub soon finds its way into the soil. There, according to most cultivators of fruits, and to our own observation, the grubs or

larva remain till the ensuing spring, when in their perfect form they again emerge as beetles and renew their ravages on the fruit. It is true that Harris and some other naturalists have proved that the insect does sometimes undergo its final transformation and emerge from the ground in twenty days, but we are inclined to the opinion that this only takes place with a small portion of the brood which, perhaps, have penetrated but a very short distance below the surface of the soil. These, making their appearance in midsummer and finding no young fruit, deposit their eggs in the young branches of trees, etc. But it is undeniable that the season of the plum-weevil is early spring, and that most of the larvæ which produce the annual swarm remain in the soil during the whole period intervening since the fall of the previous year's fruit. Plum trees growing in hard-trodden court-yards usually bear plentiful crops.

The modes of destroying the plum-weevil are the following:

1. *Shaking the tree and killing the beetles.* Watch the young fruit, and you will perceive when the insect makes its appearance by its punctures upon them. Spread some sheets under the trees and strike the trunk pretty sharply several times with a wooden mallet. The insects will quickly fall, and should be killed immediately. This should be repeated daily for weeks, or so long as the insects continue to make their appearance. Repeated trials have proved beyond question that this rather tedious mode is a very effectual one if persisted in.*

Coops of chickens placed about under the trees at this season will assist in destroying the insects.

Dr. E. S. Hull, of Alton, Ill., has invented a machine for catching the curculio on a large scale for orchard culture, but not having seen it, we copy an extract from the *Hearth and Home*:

"This is nothing but a gigantic white umbrella turned bottom upward, mounted upon an immense wheelbarrow, and split in front to receive the trunk of the tree which is to be operated upon. At the interior end of the split in front is a padded bumper, which strikes against the trunk as the operator wheels the barrow, first against one

* Merely shaking the trees is not sufficient. The following memorandum, as additional proof, we quote from the *Genesee Farmer*: "Under a tree in a remote part of the fruit garden, having spread the sheets, I made the following experiment: On shaking the tree well I caught five curculios, on jarring it well with the hand I caught twelve more, and on striking the tree with a stone eight more dropped on the sheet. I was now convinced that I had been in error, and calling in assistance and using a hammer to jar the tree violently, we caught in less than an hour more than 260 of these insects." We will add to this, that to prevent injury to the tree a large wooden mallet should be substituted for a hammer, and it is better if a thick layer of cloth is bound over its head. A sharp, stunning blow is found necessary to readily dislodge the insect, and as such, when given directly upon the bark of the tree, often causes a bruise, it is found to be a good practice to saw off a small limb and strike the blow upon the stump.



tree and then against another, and with two or three sudden jars fetches all the insects off the boughs into the white umbrella, which gapes widely open to receive them. Really, it is a most magnificent institution, but for its practical success three things are necessary: (1) That the land should be decently clean, and not overgrown with rank weeds four or five feet high. (2) That the orchard be a sufficiently large one to pay the interest on the prime cost of the machine. (3) That the tree have a clean trunk of some three or four feet."

2. *Gathering the fruit and destroying the larvæ.* As the insect, in its larva or grub form, is yet within the plums when they fall prematurely from the tree, it is a very obvious mode of exterminating the next year's brood to gather these fallen fruits daily and feed them to swine, boil or otherwise destroy them. A simple and easy way of covering the difficulty, when there is a plum orchard or enclosure, is that of turning in swine and fowls during the whole season when the stung plums are dropping to the ground. The fruit, and the insects contained in it, will thus be devoured together. This is an excellent expedient for the farmer who bestows his time grudgingly on the cares of the garden.

THE KNOTS, OR BLACK GUM.

In some parts of the country this is a most troublesome disease, and it has, in neighborhoods where it has been suffered to take its course, even destroyed the whole race of plum trees. The knots is a disease attacking the bark and wood. The former at first becomes swollen, afterward bursts, and finally assumes the appearance of large, irregular, black lumps, with a hard, cracked, uneven surface, quite dry within. The passage of the sap upwards becomes stopped by the compression of the branch by the tumor, and finally the poison seems to disseminate itself by the downward flow of the sap through the whole trunk, breaking out in various parts of it. The sorts of plum most attacked by this disease are those with purple fruit, and we have never known the green- or yellow-fruited varieties infected until the other sorts had first become filled with the knots. The common Horse plum and Damson appear to be the first to fall a prey to it, and it is more difficult to eradicate it from them than from most other sorts. The common Morello cherry is also very often injured by the same disease, and in some districts the sweet cherry also. There is yet some doubt respecting the precise cause of these knotty excrescences, though there is every reason to think it is the work of an insect. Professor Peck and Doctor Harris believe that they are caused by the same curculio or plum-weevil that stings the fruit; the second brood of which, finding no fruit ready, choose the branches of this tree and the cherry. This observation would seem to be confirmed by the fact that the grubs or larvæ of the plum-weevil are frequently

found in these warts, and that the beetles have been seen stinging the branches. On the other hand, the following facts are worthy of attention: First, in some parts of the country where the curculio has been troublesome for many years the knots have never been known; second, in many cases the knots have been abundant on plum trees when the fruit was entirely fair and uninjured by the curculio, even upon the same branches.

These facts seem so irreconcilable with the opinion that the curculio produces both these effects, that we rather incline at present to the belief that, though the curculio deposits its eggs in the tumors on the branches while they are yet soft and tender, yet it is not to the curculio, but to some other insect or cause, that we owe this unsightly disease. Practically, however, this is of little account. The experience of many persons besides ourselves has proved most satisfactorily that it is easy to extirpate this malady, if it is taken in season and unremittingly pursued. As early as possible in the spring the whole of the infected trees should be examined, and every branch and twig that shows a tumor should be cut off and immediately burned. Whatever may be the insect, we thus destroy it, and, as experience has taught us that the malady spreads rapidly, we will thus effectually prevent its increase. If the trees are considerably attacked by it, it will probably be necessary to go over them again about the middle of May, but, usually, once a year will be sufficient. If any of the trees are very much covered with these knots, it is better to head back the shoots severely, or dig them up and burn them outright, and it will be necessary to prevail upon your neighbors, if there are near ones, to enter into the plan, or your own labors will be of little value. Pursue this simple and straightforward practice for two or three seasons (covering any large wounds made with a solution of gum shellac), and the knots will be found to disappear, the curculio to the contrary notwithstanding.

BOTANY OF THE PLUMS AND CHERRIES.

By CHARLES E. BESSEY, PH. D. (Nebraska Horticultural Report.)

Plums and cherries belong to the botanical genus *Prunus*, which in turn is a member of the family known to botanists under the name *Rosaceæ*. The genus contains, all told, nearly 100 species, widely distributed in temperate and tropical countries north of the equator. Few, if any, species occur in a wild state south of the equator, and none whatever occur in southern South America, tropical and southern Africa, and Australia and the Pacific islands. The genus may be briefly characterized as follows: . . .



C. AMERICANA PLUMS (*Pseudoprunus*). Flowers single or umbellate, white or pale rose color; leaves in the bud folded lengthwise along the midrib.*

CANADA PLUM (*P. nigra* Aiton). A small tree, with broadly oblong-ovate to obovate leaves, the leafstalks bearing two glands; calyx lobes glandular-serrate; fruit oblong-oval, one to one and a quarter inches long, with a tough, thick, orange-red skin and yellow flesh; stone compressed. Original distribution: In Canada, from Newfoundland to the Assiniboin river, and probably in the northern portion of the United States. Since this species has been confused with the next one it is difficult to say what cultivated varieties have sprung from it. Professor Sargent says, in the *Silva of North America*: "Some attention has been paid in Canada to selecting the best wild varieties for cultivation. Varieties of this species are propagated and sold by nurserymen in some of the Western states, and to it can be referred the well-known Purple Yosemite, Quaker and Weaver plums."

COMMON WILD PLUM (*P. americana* Marsh.) A small tree, with oval or slightly obovate leaves, the leafstalks without glands; calyx lobes entire; fruit globose, one inch or less in diameter, with a tough, thick, red skin and yellow flesh; stone turgid. Original distribution: New York, New Jersey, and Florida, to Montana, Colorado, and New Mexico. In Nebraska it is found in a wild condition in every part of the state. This has been very prolific in cultivated varieties. Professor Sargent refers the following varieties to this species: De Soto, Itaska, Forest Garden, Louisa, Minnetonka, Cheney, Deep Creek, Kickapoo, Forest Rose, and Miner; but Professor Bailey refers the last named to *P. hortulana*.

WILD GOOSE PLUM (*P. hortulana* Bailey). A small tree, with ovate-lanceolate leaves, the leafstalk bearing glands; calyx lobes glandular-serrate; fruit globose, two-thirds of an inch in diameter, with a thick, red or yellow skin and hard, thin flesh; stone turgid. Original distribution: In the Mississippi valley, from central Illinois southward. The cultivated varieties referred to this species by Professor Bailey are Wild Goose, Golden Beauty, Missouri Apricot, Moreman, Reed, Roulette, Wayland, and Miner.

*All the American species of plums here indicated are more nearly related to the cherries (section B, *Cerasus*) than to the true plums (section E, *Prunophora*) of the old world; and they might quite properly bear the general name of "Cherry plums." Doctor Koehne, indeed, in his "*Deutsche Dendrologie*," goes so far as to include them all in the cherry section of the genus *Prunus*. I prefer, however, to follow Doctor Dippel (*Handbuch der Laubholzkunde*, pp. 622-629) in assigning them to a separate but closely allied section (*Pseudoprunus*), which translated means literally the "false plums."

CHICKASAW PLUM (*P. angustifolia* Marsh.) A small tree, with lanceolate to oblong-lanceolate leaves, the leafstalk bearing two glands; calyx lobes glandular-ciliate; fruit globose, half an inch in diameter, with a thin, red skin and a juicy, yellow flesh; stone turgid. Original distribution: Apparently a native of the western or southwestern portion of the Southern states, but it is not certainly known in a wild state. The cultivated varieties of this species are given by Professor Bailey as Newman, Arkansas, Lombard, Caddo Chief, Lone Star, Jennie Lucas, Pottawatomie, and Robinson.

BEACH PLUM (*P. maritima* Wang.) A low shrub, with ovate or oval leaves; fruit globular, one-half to one inch in diameter, with a thick, tough, purple or crimson skin; stone turgid. Original distribution: On the sands of the seacoast, from New Brunswick to Virginia. This species has given rise, under cultivation, to a variety known as Bassett's American.

SAND PLUM. (*P. watsoni* Sarg.) A shrub six to ten feet high; leaves ovate, acute, rounded or wedge-shaped at the base, finely crenulate-serrate, lustrous on the upper surface, pale on the lower; flowers pure white, in few-flowered clusters; fruit globose, or rarely oblong, orange-red, two-thirds of an inch in diameter, containing a yellow, juicy flesh (edible, but slightly austere), and a turgid, smooth, but porulose stone. Original distribution: Southern Nebraska to central Kansas.

Professor Sargent, whose description I have given slightly modified, says that "Its hardiness in regions of extreme cold, its compact, dwarf habit, abundant flowers and handsome fruit make it an ornamental fruit of first-rate value, and, as selection and good cultivation will doubtless improve the size and quality of the fruits, it will, perhaps, become a valuable inmate of small-fruit gardens."* This is the plant of which I wrote as follows in 1891:† "Occasionally I hear of a 'Sand plum,' said to grow in the southwestern and western parts of the state. No authentic specimens have been seen, although I have in my collection some twigs and leaves from plants cultivated under this name, and thought, by the growers, to have been taken up from wild patches in the state. Although lacking in flowers or fruits, these cultivated Sand plums appear to be *P. chicasa*, the Chickasaw plum. The leaves of these specimens are much smaller than those of the ordinary wild plums; they are also smoother and firmer, and the margins have smaller serrations." I was mistaken in supposing this to be the same as the Chickasaw plum, but, as Profes-

* "Garden and Forest," April 4, 1894.

† Preliminary Report on the Native Trees of Nebraska. Bull. Agr. Exp. Station, No. 18.

sor Bailey has pointed out, it is unquestionably closely related to that species. The Sand plum is of interest to us not only on account of its being a native of the plains, but also as having produced the "Utah Hybrid cherry" by hybridizing with the Nebraska Sand cherry.

SIMON'S PEACH (*P. simonii* Carr). A small tree, with dark green, oblong-elliptical, short-petioled, finely or irregularly serrated leaves, which are three to four or five inches long and three-fourths to one and a half inches wide; flowers small, rose-red; fruit globose, flattened on the ends, one and a quarter inches long by one and a half inches broad, dark red, with a hard, yellow flesh; stone furrowed and pitted, flattened, sharp-edged. Original distribution: China. This new fruit has attracted much attention under the name given above, as well as "Simon's plum" and "Apricot plum," but although a pretty fruit, with remarkable keeping qualities, it is said to lack one very essential quality, viz., palatability. Professor Bailey says: "The flavor in all the specimens I have tasted is very disagreeable, being mawkish, bitter, and leaving a pronounced bitter-almond taste in the mouth. I have never tried a specimen which I could say was edible, and this is an unwilling confession, because the fruit is exceedingly attractive to look upon." However, upon the Pacific coast it is considerably grown, and market quotations given by Professor Bailey indicate that it brings high prices.

MYROBALAN PLUM. (*P. myrobalana* Lois).—A shrub or small tree, bearing thin, elliptical or ovate-elliptical leaves, which are smooth and green above, light green below, and hairy on the ribs, finely and irregularly serrate, and one and a half to two inches long and about half as wide; flowers single or in twos, stalked, small, and white; fruit globose, about an inch in diameter, yellowish-red, its flesh somewhat soft, sweetish, enclosing a smooth, flat and sharp-pointed stone. Original distribution: Asia Minor, Transcaucasia, Turkestan, and southwestern Liberia. This species is used mainly as a stock upon which to bud other kinds of plums. Several varieties known as "Cherry plum" have been produced by long cultivation, but they do not appear to possess much merit. Recent studies of the plum have led Professor Bailey to conclusions that the De Caradeuc is of this species, and that the Marianna is of this species or a hybrid between it and some American plum, possibly the Wild Goose.

COMMON PLUM (*P. domestica* Lois). A moderate-sized tree, with thin, smooth, elliptical, or oblong-elliptical leaves, which are one and a half to three inches long and half as wide; flowers one to several in a cluster, greenish-white, appearing with the leaves; fruit blue-black, globose, elongated, an inch or more in diameter, with soft, yellowish,

sweet flesh, containing a flattened, sharp-edged stone. Original distribution: Not certainly known, but probably in Asia Minor. Among the many varieties of this species now grown in the eastern United States the following are given by Professor Bailey: Lombard, Bavay, Green Gage, Bradshaw or Niagara, Coe's Golden Drop or Silver Prune, French and Shropshire Damsons, German Prune, Fellenberg, Gueii, Moore's Arctic, Green Gage, Prune d'Agen, Hungarian Prune, Copper, Jefferson, Imperial Gage, Quackenbos, Yellow Egg, Washington, and French Prune.

JAPANESE PLUM (*P. triflora* Roxb.) A small tree, with smooth, oval or ovate leaves, one and a half to three inches long, and half as wide; flowers usually in threes, on short stalks; fruit globose, purple, with reddish-yellow flesh. Original distribution: Northern China. Of this species, which has but recently been introduced from Japan, Professor Bailey gives the following varieties: Kelsey, Burbank, Abundance, Satsuma, Chabot, Maru, Ogon, Red Nagate. Some of these may prove hardy in Kansas.

AMERICAN PLUMS FOR AMERICA.

Read before the American Pomological Society, in September, 1899, by E. S. GOFF, professor, University of Wisconsin, Madison, Wis.

It would be folly to claim, for the sake of argument, that the introduced plums have proven a failure in the United States. Our fruit markets during the plum season would belie such a proposition. The European plum, with proper culture, succeeds over a very considerable part of our country, and its choicer varieties are among the most delicious of fruits. The more recently introduced Japanese plums have doubtless gained ground faster in our culture and in our markets than any other exotic fruit that has been brought to our country. The remarkable vigor and prolificacy of this species will insure its permanence on our soil, and while the average quality of its fruit is very low, the excellence of a few of its varieties leaves no reason to doubt that it will yet furnish plums as delicious as the choicest European sorts. But both the European and Japanese plums have inherent defects that must forever prevent either of them from becoming the national plum of North America. The flower-buds of neither are reliable to endure the winters of the Mississippi valley much north of Mason and Dixon's line. The European plum is so susceptible to the curculio that its fruit can be secured only at the price of interminable warfare against this insect. The Japanese plums bloom so early in spring that they are comparatively unsafe, even in many localities where their flower-buds have passed the winter.

The European plum has been introduced nearly 300 years, yet it has not become a companion of the apple tree, the cherry tree, the raspberry and the currant in every thrifty farmer's or laborer's yard anywhere in our land, unless it be on the Pacific slope, for the reason that it cannot be depended upon to bear fruit without special treatment. The Japanese plums may become more of a family fruit than the European sorts have become, but their uncertainty of fruitage renders this improbable. We have, however, native species of the plum that, when grown in their proper areas, are capable of supplying plum trees for every farmer's and laborer's garden in our land that shall be as reliable for fruiting as the apple, with little, if any, more special knowledge or care than the apple requires; of which the fruit is excellent for all culinary purposes, and of which the choicest varieties are scarcely surpassed in delicacy and richness by any fruit of our country, and for which the market demand is rapidly increasing. The *americana* plum is hardy, both in tree and flower-bud, throughout the United States and far northward into Canada. The past winter its flower-buds endured fifty-two degrees below zero in Manitoba, where the Oldenburg (Duchess) apple, in the same locality, had its last year's growth frozen back three-fourths. Other species of the native plums succeed in the far South and Southwest.

It may be safely said that no other tree fruit of equal value has so wide a climatic range in North America as the native plums, and throughout the northern Mississippi valley no other tree fruit can be depended upon to yield more dollars per acre in ten-year periods than these native plums. The native plums, especially of the *americana* species, are exceedingly variable. At the risk of incurring the ridicule of this the most dignified association of fruit-growers in America, if not in the world, I make the unqualified statement that the richest and most delicious quality that I have ever tasted in plums has been found in native specimens. It is true that the average *americana* plum has a thick and often acerb skin, which in objectionable, but there are exceptions to this rule. A few of the choicer varieties, when fully ripe, have a skin nearly or quite as thin as that of the average European or Japanese plum.

In the *americana* plum we sometimes find varieties that are perfect freestones. It should be remembered that, while the European and Japanese plums have been in culture for many centuries, the most highly improved of our native plums are but two or three generations from the wild-plum thicket. When we consider this fact, their present value as a family and commercial fruit certainly offers remarkable promise. There is no reason to doubt that during the coming century the native plums will yield varieties that shall be

equal in all respects to the choicest plums of foreign species, with the advantage that they will be more hardy and more uniformly productive.

I would not prejudice any against the European or Japanese plums. Let all grow them who can. But I would remove the prejudice that exists in the minds of some, that the best natives are unworthy of culture where the foreign plums can be grown. The large market demand for the best native plums that have grown up in the West fully disproves such a proposition. Let us treat our native plums for what they unquestionably are—a most promising fruit, that is destined to play a most important part in American pomology; let us seek to improve them by every means known to horticulture, and their future will certainly take care of itself.

THE NATIVE SAND PLUM.

From Press Bulletin No. 6, Kansas Experiment Station, 1898.

Among the native fruits of Kansas there is none more interesting or valuable than the Sand plum (*P. watsoni*). Distributed abundantly over the western half of the state, it borders the streams and covers the adjacent sand-hills, sometimes extending into the clay uplands, but always at a loss of vigor in growth and quality of fruit.

In its natural habit it attains a height of from two to eight feet, having usually a tree-like form, though often branching and bearing fruit from ground to top. Branches horizontal, with a tendency to zigzag and tangled growth, and often terminating in sharp, spiny points. Twigs slender, of cherry-red color, and abundantly supplied with lenticels. Leaves thick, glabrous, very finely serrate, serrations sometimes so pointed as to be spiny. In shape leaves are usually acutely lanceolate, in length varying from one-half to two and one-half inches, and in habit conduplicate or trough-like when exposed to brilliant sunlight, but almost flat in dim light. Blossoms small, occurring in dense clusters in early spring. Fruit oblong to round, yellowish pink to dark red, one-half to one and one-fourth inches in diameter, ripening from July 1 to September 15. Stem one-fourth to three-fourths inch long, slender. Pit small, roundish to long, slender and pointed. The plant propagates most rapidly by sprouts from the roots. If a specimen is dug from a thicket, it will generally be observed to have but a single large root, eight or ten inches below the surface, which extends to it and passes on, supporting perhaps half a dozen other bushes.

The Sand plum has varied into many types. But it has not pro-

duced, as we might suppose, different types for different localities; it has crowded them close together, often in the same or adjacent thickets. Near the Arkansas river were found as many as six perfectly distinct types on a ten-acre lot. Profusion of varieties is to be noted in every favored location. It has been thought that the roots of this hardy plum might make valuable stock for the grafting of domesticated varieties, but experiments at the station tend to prove the reverse. Numerous varieties were grafted, using *P. watsoni* as the stock. Failure in almost every instance was the result. The tender, succulent roots do not unite readily with a foreign scion. Even if a union were secured, the propensity of the stock to sprout would at once exert itself, resulting soon in a dense thicket. The propagation of the species is easily accomplished by means of root cuttings or seeds, preferably the latter.

The following forms are the most valuable we have been able to find:

1. A common type growing in almost pure sand, four to ten feet above the water level. Bushes in scattering thickets, two to four feet high, branching, and bearing fruit from the ground up. Leaves small, one to two inches long; never open to a plain surface, thick, shining, finely serrate. Fruit three-fourths to one and one-eighth inches in diameter; globose. Color bright red, clouded over lemon-yellow ground. Flesh yellowish, tender, juicy, sweet, somewhat fibrous, and adhering firmly to the stone. Ripe in southern Kansas the first week in July.

2. A small group of bushes growing in a very large thicket on the Arkansas river. Bushes extremely dwarfish but tree-like, three to four feet high. Branches unusually stout, growing laterally more than upright. Leaves larger than on common types, dark, shining green. Fruit large, one inch to one and one-fourth inches in diameter, rounded or flattened. Color dull red, but somewhat hidden by the heavy bloom. Flavor excellent. Ripe in latter part of July. A variety surpassing many cultivated sorts.

3. A small clump of bushes found near the variety last described. Bushes small, two to three feet high. Foliage scant, leaves small. Fruit fine in appearance, one inch to one and one-fourth inches in diameter, roundish, bluish-pink color with delicate bloom. Skin thin. Flesh juicy, melting, rich. Flavor sweet and good. The most delicious Sand plum that has yet come under our observation and worthy of place in any orchard.

The hardiness of the Sand plum in its native state, its productiveness and the excellent quality of its fruit are among its most promising characteristics. By cultivation and proper breeding, the size,

keeping and shipping qualities of this plum will, it is thought, be strengthened. The experiment station has now in operation extensive experiments along these lines. During the past season a large collection of data and of pits for planting has been made from the Sand-plum districts of the state.

NOTES ON SEVERAL VARIETIES.

The American Pomological Society, which is now half a century old, may safely be counted the best authority in this country on fruits and fruit-raising, and we append here a list of plums recommended by it, in its report for 1899, for the district comprising that part of Kansas below 2000 feet elevation:

Prunus americana: As reliable—De Soto, Forest Garden, Hawkeye, Ocheeda, Quaker, Rockford, and Rolling Stone. Extra, or double starred—Weaver, Wolf, and Wyant. Promising—Gaylord, New Ulm, Piper, and Stoddard.

P. angustifolia: Yellow Transparent. Double starred—Caddo Chief and Pottawatomie. Promising—Newman.

P. cerasifera: Marianna and its hybrids.

P. domestica: Albert (yellow), Bavay (Bavay Green Gage, Reine Claude de Bavay), Hudson River, Purple Egg, Huling's Superb, Imperial Gage, Italian Prune (Fellenberg), Smith Orleans, Wangenheim, Washington, and Yellow Egg. Double starred—Damson, Lombard, and Shropshire Damson.

P. hortulana: Miner group (double starred)—Miner. Wayland group—Cumberland and Golden Beauty. Wild Goose group—Downing (Charles) and Wild Goose, (both double starred).

P. triflora (Japan): Ogon, Red June, Red Negate, Satsuma, and Willard. Double starred—Abundance and Burbank.

At the twenty-sixth biennial meeting of the American Pomological Society, at Philadelphia, in September, 1899, a Wilder silver medal was given to C. L. Watrous, of Des Moines, Iowa, for a collective exhibit of the following new plums: Brittlewood, Bursota, New Ulm, and Silver.

THE RED-LEAVED PLUM.

Our first plant of this was set upwards of twenty years ago, as we now remember; at any rate it was just after its announcement in this country. The stock and scion were not congenial. The top grew luxuriantly enough, however for ten years or so, but the stock ceased to grow, so that the plant was strangled, so to say. Two years ago last fall we planted another Pissard plum. The tree is at present but eight feet high, yet it has borne freely. The plums are a full inch in diameter, either way, being round, and of a reddish-purple color. The

quality is inferior, and the fruit would be of value only for preserves. The plums ripen very early, before those of any other variety that we have ever tried—this year July 12. As a small, purple-leaved tree, Pissard's plum has no equal. The leaves, when they first unfold, are of a brilliant purple. This grows darker during the summer and remains so until the leaves fall.—*E. S. C., in Rural New Yorker.*

WILL PLUMS PAY?

Plums are growing in demand every year at the same ratio as any other fruit. More plums are used now than ever before. True, they do n't bring the higher price they did twenty years ago, but relatively bring as much as other fruits and turn off as much money as other fruits. And now the season has been lengthened, both in early and late varieties.

Heretofore the Wild Goose has been the first to ripen; now the Milton leads it by two weeks. This is followed by the Red June, then Willard, Wild Goose, Charles Downing, Abundance, Burbank, Pottawatomie, the most prolific of all plums. This takes us through the midseason of plums. Of the late kinds are Forest Garden, Golden Beauty, De Soto, Wolf, Wickson, Arkansas Lombard, Hawkeye, Stoddard, and common Damson. The varieties suffering the most the past winter were Red June and Willard, both Japan sorts. The hardiest were Wild Goose, Miner, Pottawatomie, and Stoddard; also, Hawkeye and De Soto went through the winter unhurt. The latest-blooming varieties are Hawkeye, De Soto, Stoddard, and Wolf.

To classify them, Red June, Willard, Abundance, Burbank, Hale and Wickson are of Japan origin; Wild Goose, Milton, Charles Downing, Pottawatomie and Arkansas Lombard are of the Chickasaw or red varieties; De Soto, Wolf, Forest Garden, Hawkeye, Stoddard and Wyant are of the American class. These are mostly natives of Iowa and other Northern states; hence their hardiness.—*G. F. E., in Western Fruit Grower.*

THE SATSUMA PLUM.

A correspondent of the *Rural New Yorker* says: "The criticisms that have been made by many, in relation to the Satsuma plum not fruiting freely, have seemed to apply to young trees, for we are all learning that as the trees of this variety grow older they are inclined to become very productive, in some cases so much so as to surpass nearly all others. It is a wonderful plum in its keeping and shipping qualities, and nothing can compare with it for canning purposes. I predict that within a few years Satsuma will take a much higher place in the opinion of orchardists than at the present time."

CHARACTERISTIC POINTS OF THE ABUNDANCE.

"Out of the great company of plums the public has sorted the two Japs, Abundance and Burbank," as some one neatly puts it. There may be nothing specially new to tell about these, yet there are two interesting items which a *Country Gentleman* correspondent says he has never seen in print concerning the Abundance plum, and these he gives as follows:

The first is that the crop does not all mature at once. In fact, in looking over the tree while the fruit is yet green, it will be found that the plums vary greatly in size. This seems to be a difference in age, because it is maintained to the full period of maturity. Hence, the crop of a single tree never ripens all at once, or anything like it. While some of the specimens are fully ripe, others will be hard, green, and not even grown out. While this may be an objection to it as a market variety, because of the increased labor of gathering, it certainly is a most valuable feature in the family orchard or garden, where the entire crop is not wanted at once.

Another point which, if it has been noted, has escaped my attention is, that in order to secure the best flavor and the highest coloring in the Abundance plum it must be picked early and ripened in the house, like a Bartlett pear. If allowed to become soft and fully colored on the tree half the flavor is gone, and the bees and wasps will often be found garnering the little which remains. It may be gathered while yet green, and, if placed in a dark drawer, it will color up beautifully, with a delicate bloom, and reward you with a flavor of surprising excellence. It is very juicy, sweet, and rich, and can be compared with nothing so well as the old genuine Green Gage, which I have always regarded as the standard in flavor and quality. While the flesh does not part so readily from the stone, which is very small, it does not cling to it as tenaciously as others of this species. Like the Green Gage, it is breaking and buttery in the mouth. And I have often seen specimens of that grand old variety, ripened in the full sun, that were colored much like the Abundance. In the Abundance, I think, we have its full cousin, at least as to flavor, while the brilliant coloring is more attractive, and its general vigor and productiveness make it more desirable. The little knight of the crescent calls around on time, of course, and leaves his well-known autograph. But that is the last of it for this thick-skinned Japanese member of the *Prunus* family. The plums grow right along and ripen up sound and perfect, without either eggs or larvæ of any foe. Why not plant the Abundance plum?

Replying to some questions of a correspondent, the *Rural New Yorker* says: "The Abundance trees are those that have an upright habit, and Burbank those that grow straggling and spreading in habit. The idea in pruning the Abundance trees should be to head them back from making tall, slim trees, and yet not have them too compact. To prevent the latter, some of the interior branches will probably need to be cut away. The heading in at the top should be done every year or two. The Burbank trees should be pruned so as to induce an upright growth, which may be done by cutting back the straggling and drooping branches."

The *Country Gentleman* has this to say: "One of our correspondents who is so greatly in love with the Abundance plum says some true, as well as good things, about it. It is well to remember, however, that there are many other favorites in the list of plums. Burbank succeeds beyond measure with some growers. A few think there's nothing like Satsuma. Still others say the old Lombard is most profitable of all. Some have made most money out of Wild Goose. And so it goes. The fact is there exists an endless diversity in the adaptation of special plums to particular localities; and these adaptations must be studied by the plum grower. No general recommendation of any one variety for all soils and all climates is safe. There are lots of good varieties, but the best of them fail in some localities. There is no variety which seems to succeed over a wide range of territory, like the Ben Davis apple or the Concord grape."

A Windham county, Vermont, fruit-grower relates his experience with the Japan varieties: "A Burbank plum tree was set out three years ago last spring. When planted it was what is known in the nursery as a small tree, one year old. I prefer these small trees to the larger ones, for I get better roots thereon; and while the tree is only a straight stalk I can, by cutting it back, get the low head which I so much desire. This particular tree measures eight and one-half feet in height, and the branches spread sixteen feet, while the trunk is only one foot from the ground to the first limbs. The past season in thinning the fruit I cut off seven-eighths of all the plums on the tree, and then picked about two and one-half bushels of the choicest fruit, that averaged six inches in circumference.

Some of the specimens measured six and three-fourths inches. The fruit was very evenly distributed over the tree. My method of trimming plum trees is to cut back at least two-thirds of each season's growth, and in the spring of 1897 I cut off from this tree many sprouts that measured six feet in length, leaving a stub three feet long. I believe that this tree, when the fruit was fully ripe, was the finest sight I ever saw in the fruit line."

PLUMS THAT SUCCEED.

People are becoming more interested in plums since the Japanese varieties were introduced. The introduction of this type has also increased the interest in varieties belonging to other classes. People are eagerly seeking information regarding varieties, and the experience of William Jenkins, of Knoxville, Tenn., as given below, will doubtless be of interest to those contemplating setting plums.

Of the Japanese plums, Abundance, Burbank and Wickson have given the best results. Abundance is the best known of this class. It is very productive, and the fruit should be thinned to secure large specimens. Burbank is also well known. It is considered by Prof. L. H. Bailey as the best Japanese plum yet tested in New York. The fruit of Wickson is very large, deep maroon-red, firm, and of good quality. Besides the Japanese varieties, Mr. Jenkins regards the following successful: Bradshaw, the fruit of which is large, dark purple, juicy, good, slightly acid; tree vigorous and productive. Lombard, medium size, violet red, flesh deep yellow, pleasant, fine quality; tree very prolific. Saratoga, oval, brownish red, flesh pale yellow; a late variety. Spaulding, medium size, yellow, green marbled, flesh pale yellow, very sweet. Peter's Yellow Gage, large, rich yellow, crimson dots next the sun, flesh greenish yellow, rich, sweet, very good. Archduke, large, black, prolific, late. Grand Duke, very large, good quality, productive, color of Bradshaw.—*Southern Florist and Gardener*.

FOUR VERY CHOICE VARIETIES.

Luther Burbank, of California, who began his work by originating the Burbank potato while living in his native state of Massachusetts, has made a lasting mark in American horticulture as the originator of new fruits and flowers. Professor Van Deman has recently given an interesting sketch in the *Rural New Yorker* of Mr. Burbank and some of his remarkable achievements, from which the following in regard to late work with plums is reproduced:

ROYAL is the result of a cross made by using pollen of Simon upon one of the Botans. It is about the largest plum I have ever seen, except Kelsey. The shape is oval and quite regular. In color it is a deep, reddish purple, very rich looking and attractive. The flesh is yellow and firm until fully ripe, when it becomes melting and juicy. It is almost a freestone. The flavor is a pleasant sub-acid, with a peculiar aroma that is deliciously refreshing. The quality is much better than that of any early plum I know, and is good compared with any kind. It ripens before Willard or Red June.

BARTLETT, another variety, is a cross of Simon upon Delaware. Its size is medium to large and the shape peculiar, being decidedly heart-shaped, with a distinct suture on one side. The color is a dull purplish red. The flesh is yellowish and soft when fully ripe. The stone is large and long. Its flavor is very peculiar, being like that of the Bartlett pear; hence the name. The quality is very good to best, which, with its earliness, productiveness, and vigor of tree, ought to place it well up in the scale.

CHALCO is a seedling of Burbank pollenized by Simon, and resembles the Simon in shape, which is flat, but is larger and very much better in quality. I would call it very good, and quite free from the peculiar bitterish flavor of the

Simon plum. The main objection that will be raised to it is the resemblance to the shape of that variety, which has become unpopular in market because of its flavor. The color is rich yellowish red. The texture of the flesh is about all one could desire. The stone is small in proportion to the flesh.

GARNET is my choice of all the new plums which I have tested. It is a cross between Wickson and Satsuma. It is large, being over two inches in diameter, and nearly round in shape. The surface is smooth, dark wine—red or garnet—being very handsome. The flesh is garnet color, too, and rich looking. This color suggested the name Garnet. In flavor it is excellent, being tart enough, yet not sour, but a delicious subacid. No plum that I have eaten is better, and when cooked it could scarcely be equaled. It has all the high flavor of Satsuma when cooked, which has heretofore been far above all other plums when in that condition. The season of Garnet is at least a month earlier, as it is fully ripe by August 1. The tree is very fruitful. I look for this plum to take a high place in public favor.

ANOTHER NEW ONE BY MR. BURBANK.

Among Mr. Burbank's latest creations in plums the Climax bids fair to take a high rank. The fruit is described as strongly heart-shaped, very large—as large as an ordinary peach—cavity deep and abrupt, stem short and strong, suture plainly marked, but not deep, apex rounded; color deep dark red, many yellow dots, large and small; skin thick, firm; flesh yellow, firm; stone large, somewhat turgid, roughened, free; flavor sweet, rich, fruity; quality fine; season earliest. Professor Waugh, of Vermont, says this is justly regarded by Mr. Burbank as one of his most valuable productions, and if upon extended test it proves hardy, fruitful, and otherwise reliable, it will be an advance in many respects upon any plum now known.

THE BRADSHAW PLUM.

A very large and fine early plum, dark violet red, juicy and good; valuable for market. The tree is erect, hardy, vigorous, and very productive. As regards productiveness, it is unequalled by any plum we have ever fruited. To produce the finest fruit, heavy thinning should be practiced. The quality is excellent, and it is destined to become one of the most popular of all plums for canning, while its attractive color, good quality and shipping qualities will cause it to be sought for as a market variety. It ripens ten days to two weeks later than Abundance. This plum resembles Niagara in size, color, and general good qualities. It is a grand variety and no collection is complete without it. It is becoming better known each year, and is a great favorite for home use on account of its fine quality and for market, for the reason that it is possessed of great beauty and large size and is enormously productive.

ANOTHER MAN'S IDEA ABOUT GOOD PLUMS.

The Reine Claude is generally counted as a short-lived tree. Its tendency is towards heavy bearing, and, unless the fruit is thinned, the tree soon exhausts itself. With proper thinning and good culture, care, and feeding, the Reine Claude may be made to live and produce profitably for a generation. The great plum grower of western New York, S. D. Willard, had, a few years ago, some Reine Claude trees which had been set twenty-two years and borne seventeen full crops. They had failed only one year after coming into bearing. When I saw them they gave indication of still being profitable for several years.

Among Japans, the Yellow Japan is superior in flavor, beauty, and quality. It is a late sort.

The Bradshaw is a very profitable sort. It is large, productive, and of good

color, and the tree is a vigorous, thrifty grower. The quality is not of the best, but it is a profitable market variety. Like all European sorts, it is liable to black knot badly.

The Japanese plums, as a class, have proved their ability to resist the black knot. While here and there a few knots have been found, they are scarce and not serious enough to make any count of. Still, they disprove the claim that the Japs are black knot proof. However free they may be from this trouble, they have a decided susceptibility to the rot. They also set fruit so thickly that it touches all along the limbs. But careful thinning and spraying with Bordeaux mixture will check the rot. Another bad fault is the early blooming of many varieties. A late frost will often catch them and destroy the entire crop.—*Green's Fruit Grower.*

JAPAN PLUMS IN COLORADO.

A correspondent of *Green's Fruit Grower* says: "I have many varieties of Japan plums growing and have found several that are of no use here, owing to lack of hardiness, both of tree and bud. Red June is all right and should be extensively planted; also Willard and Ogon. These are perfectly hardy and will please all who give them a trial. Burbank is also quite promising. Hale and Wickson no earthly use in Colorado; trees won't stand even zero weather. Satsuma badly killed this year, though they bore some fine fruit last year. I shall plant largely of Red June and Ogon." Commenting on the above, the editor says: "This report of Japan plums in Colorado will be interesting to people living in the far West, where the winters are far more severe and the changes of temperature more sudden than in the Eastern and Middle States. At Rochester, N. Y., and wherever the thermometer does not go below ten or twelve degrees below zero, we have found all of the Japan plums named by Mr. Jewett perfectly hardy. We consider the Japan plums as a class, and such varieties in particular as Hale, Wickson, Burbank, Abundance, and Red June, very valuable varieties, and worthy of extensive trial."

THE HALE JAPAN PLUM.

This is another one of the creations of Mr. Burbank, the California originator, who has made his name famous as an originator of superior fruits. This variety was purchased by Mr. Hale, a successful fruit-grower, known as the "Georgia peach king." Mr. Hale has great confidence in this variety of plum. He says the quality is superb. It ripens September 15; is of large size and possessed of great beauty. Mr. Hale has planted it largely for market and considers it a profitable market plum. Prof. L. H. Bailey has also tested this plum, and considers it of great value on account of its beauty, large size, and fine quality. He says it is delicious, slightly acid, and possessed of a peachy flavor. The color is yellowish red, very attractive. Professor Bailey thinks the quality the best of all Japan plums he has eaten. Luther Burbank places a high estimate on the Hale plum. He says no one who has ever tasted this variety when ripe will ever say any European plum is superior to the Hale.

A correspondent in Greene county, Missouri, says the Hale variety "seems to be perfectly hardy everywhere, so far as we can learn. It is a tremendous grower, and grows later in the season than most of the other Japan plums. Like the Satsuma and Wickson it blooms rather early, and therefore is likely to be caught occasionally by late spring frosts. Yet it is of such high quality that it is worth testing everywhere where any of the Japan plums can be grown."

SOMETHING ABOUT THE CHABOT.

The Chabot plum, also known as the Bailey, Chase, and Yellow Japan, is, according to Prof. L. H. Bailey, deserving of much praise. The tree is a strong,

upright grower, productive, and the fruit is handsome, very firm, and of good quality. In general appearance the fruit is much like Burbank, but it is more pointed and from one to three weeks later, and the tree, which is an upright grower, is very different. Last year it ripened at the Cornell (N. Y.) station from September 15 to 25. There seem to be two things passing as Chase, the other one being an earlier plum and perhaps identical with Douglas. Professor Bailey can detect no difference between Chabot, Bailey, Chase, and Yellow Japan, and the same also passes as Hattonkin; but Chabot, being the older name, must hold.

THE NEW OCTOBER PURPLE.

The October Purple is a splendid grower, ripens up its wood early to the tip, bears every season, and fruits all over the old wood on spurs, instead of away out on the branches, like many other kinds. Fruit very large and uniform in size. It is a superb variety. The fruit is described as measuring a trifle over seven inches in circumference, and shows long-keeping quality. The fruit is round in form; color a reddish purple—a little darker than the Bradshaw; flesh yellow, and in quality superb; stone small. The tree is a strong, erect grower, forming a nice, shapely head, something like Abundance in this respect, but more symmetrical and shapely. Its season of ripening is about a month later than Abundance or Burbank, or from the middle to last of September. Its large, even size and beautiful color, late season in ripening, long-keeping and superb quality will make it a very desirable variety for the garden or for the market.—*American Gardening*.

JAPANESE PLUMS IN NEW JERSEY.

That the advent of the Japanese plum has caused renewed interest in plum culture throughout the country there is no doubt. For many years previous, home-grown plums were a rarity. What with curculio, rot, and black knot, it was more than the average farmer cared to undertake to produce fruit. Not that these enemies need frighten the one determined to win. New York fruit-growers have been growing plums successfully for years, before and since the introduction of the Japanese sorts. But the average farmer who sets out a few trees for family use desires something that will take care of itself after being planted, which this plum will not do.

Those who were the first to set out Japanese plums soon came to believe that they had found a kind to resist the curculio, and this belief still exists. A successful orchardist in Atlantic county, New Jersey, told me that, though it appeared to him that the fruit was stung, the egg, if deposited, did not develop. Some fruit dropped, from other causes apparently, but with this there was more on the tree to ripen than good-sized fruit called for.

These Japanese sorts hereabouts have been bearing for two or three years. This year all growers report a very heavy crop. About four years ago, Edwin Lonsdale, of Chestnut Hill, set out a small orchard of Abundance and Burbank. It was my pleasure to see the trees full of ripe fruit toward the close of July, and they were a cheering sight. The trees were overloaded with fruit. Mr. Lonsdale had found, in previous seasons, a tendency to rot in the fruit when about to ripen, and had looked to this as a probable thinning. This, however, occurred to such a slight degree that it would have been better to thin them. Mr. Lonsdale thinks the rotting may have been prevented by the two sprayings which were given early in the season, which also kept off the curculio. While no doubt something is due to the spraying, there are other fruit-growers who have not sprayed who had fair crops of fruit. In conversation with a fruit-grower from near Lancaster, he informed me that orchards of Japanese plums there produced

good crops this season without being sprayed, and similar cases nearer home have come to my notice.

The Abundance and Burbank are often listed as "yellow, overspread with red," which, while strictly true, as seen here, is misleading, giving to many the idea that they are getting a yellow plum, while, in fact, the color is red. If described as red on a yellow ground, it would be better.—*J. M., in Practical Farmer.*

PLUMS HARDY IN NEW YORK.

A correspondent of the *Rural New Yorker* wanted a list of the early to medium late plums that would stand the climatic changes in Jefferson county, New York, and the editor prints the following: "A list of plums that are very hardy is easy to arrange, but most such kinds are of the native species and ripen within a rather short time, which latter is an objection. Wolf, Rockford, Stoddard, Forest Garden and Hawkeye are among the best of this class. Of the European type, Arctic, Lombard and German Prune are said to be the hardiest by those who have thoroughly tested them. It has been found that Burbank, which is one of the Japan type, is quite hardy and exceedingly productive."

THE UNCLE BEN AND DAMSON PLUMS.

The *California Fruit Grower* has (or did have) a sample of Uncle Ben plums, raised near Napa, Cal., and describes it as follows:

"The Uncle Ben was about two and one-half inches around in two directions, each at right angles to the other; in color it was a deep yellow spotted with red; the flavor was exquisite; the ripest among the samples was a golden, bloom-surfaced bag which was filled, grape-like, with a sweet, delicious juice; the stone was small and easily freed from the surrounding nectar. It should prove a valuable plum around Thanksgiving time."

The same authority, speaking of the Damson plum, says: "It is perhaps the hardiest and healthiest tree of the *P. domestica* family. It should prove a great aid when planted with self-sterile varieties that bloom with it. Used as a stock for double-working, it could scarcely be beaten. Moreover, the Damson as a source of profit is not to be despised."

A LIST OF SUCCESSFUL PLUMS.

H. E. VanDeman, in *Green's Fruit Grower*, says: "Plum growing for profit is becoming far more common than formerly in the East and South, because of the introduction of the Japanese and American types. They are but little affected by the curculio, which is the bane of the plum growers east of the Rocky mountains, where the European type is a most eminent success. The two former classes are very popular in the markets because of the bright red color of nearly all of their varieties, and their hardiness and fruitfulness make them satisfactory to the growers."

American.—Milton, Wooton, Whitaker, Rockford, Stoddard.

Japanese.—Red June, Abundance, Burbank, Wickson, Hale.

European.—Clyman, Bradshaw, German Prune, Grand Duke, Monarch.

A COMPARISON OF VARIETIES.

A "press bulletin" from the Ohio Experiment Station contains the following list of plums most desirable in the state of Ohio, and says:

"Those varieties which are denominated as American are natives of this country, and, as a rule, are harder than either European or Japanese varieties. The American sorts are subdivided into several classes, but no classification is attempted here. Because of reliability most of them may be safely planted, but they are less salable than the European varieties; hence, as an orchard venture,

the planting of American sorts could be easily overdone. Successful orchard culture of plums must, in the future, depend very largely upon the selection of the best varieties for market. As a rule these must be those bearing the largest and most showy fruit, and must be so selected as to cover as long a period of ripening as possible. All of those named, and many more, have been grown at the Ohio Experiment Station, but the conclusions drawn are not merely from the station tests, but from observations elsewhere as well."

German Prune.—A reliable variety, especially valuable for market. Fruit medium to large; dark purple; of good quality; season medium to late. Rather a weak grower, and succeeds better if top-worked on some free-growing sort.

Pond's Seedling.—Fruit large to very large, of medium quality; bright red; tree vigorous and prolific, but fruit inclined to rot. Not regarded as a very profitable market sort and not high enough in quality for dessert. Season late.

Grand Duke.—A very fine, large late variety; dark blue in color, and very attractive in appearance. A slow grower and ought to be grafted on some other vigorous hardy variety.

Bradshaw.—Tree a fine grower and prolific, but rather long in coming into bearing. Fruit large, purple, and of good quality. The earliest of the large sorts and one of the best for all purposes.

Wolf.—One of the best American varieties, but inclined to overbear. The trees begin bearing early and need close pruning to thin the fruit.

Spaulding.—A yellowish-green plum of excellent quality. Choice for home use, but may not be sufficiently prolific for market. The claim of the introducer that it is curculio-proof is unfounded.

Coe's Golden Drop.—A large, late-ripening, yellow variety. Tree a slow grower and should be top-worked on some free-growing sort.

Tatge.—Said to be very hardy, but can hardly be distinguished from the Lombard.

Weaver.—One of the best of the midseason American sorts. Rather dull in color but excellent for culinary purposes.

American Eagle.—One of the best of the American sorts because of large size and good quality.

Imperial Gage.—A greenish-yellow plum of the best quality. Especially desirable for the home garden.

Richland.—A reliable midsummer variety, but too small for market purposes.

Missouri Green Gage.—A greenish-yellow plum similar to Green Gage, but a little larger. Of the very choicest quality. Season medium to late.

Reine Claude de Bavay.—Greenish-yellow, late in ripening; of the best quality and very prolific. One of the best, either for home use or market.

Archduke.—A large, dark purple, late-ripening sort, and very promising, but not fully tested.

Reed.—A wonderfully prolific American sort. Fruit of medium size, bright scarlet, very beautiful, and with very much of the Damson flavor when cooked. Very ornamental in foliage, flower, and fruit.

Prairie Flower.—A medium to large American sort, of good quality, with but little astringency. Does not drop as badly as some varieties of this class and appears to be very promising.

Hawkeye.—One of the largest and best of the American varieties, but with rather too much astringency next to skin and stone.

Forest Rose Improved.—A little later and larger than Forest Rose, and more attractive in color as well.

Chabot.—One of the best of the Japanese varieties. Medium to large, yellow,

nearly covered with scarlet, and of good quality. Later, hardier and less inclined to rot than Burbank.

Bailey.—Appears to be much like Chabot, but, as we have it, it seems to be much hardier.

Gold.—A prolific and early bearer; fruit a clear yellow, partly overspread with red; medium to large, but not of first-rate quality.

Lincoln.—Fruit large to very large, coppery red, and of good quality. Valuable for home use or market but slow in growth, and should be worked on some other variety.

Red June.—One of the hardiest and best of the Japanese sorts. Especially valuable because of earliness.

Abundance.—Tree upright in growth and prolific; fruit medium to large, and of excellent quality. Desirable.

Burbank.—Tree a vigorous grower, very prolific, and begins bearing when very young. Fruit medium to large, showy, and of good quality, but much inclined to rot.

Gueli.—A reliable dark purple variety. Although much inclined to rot, it should be included in the list of profitable orchard sorts.

Moore's Arctic.—Rather too small for market, but the fact that it is hardier than most other varieties of its class makes it valuable.

VALUE OF JAPAN PLUMS.—HARDINESS COMPARED WITH PEACHES.

They stand the cold.—I am growing Japan plums in orchards quite extensively in Connecticut and Georgia, and am convinced that many of the varieties have points of merit that will make them permanently valuable orchard fruits in these sections, but in the central Atlantic states, say from Philadelphia to South Carolina, they bloom so early that they are often liable to be caught by spring frosts. At the North they will stand a great deal more freezing than peaches. I think it is safe to plant them anywhere where the mercury does not go much below twenty-five degrees below zero. In my orchards in Connecticut, at this time, peach buds, even on the most hardy varieties, are all killed, and while the plum buds are somewhat hurt, there are more than enough left for abundant crops; probably very severe thinning will have to be resorted to to secure full-sized fruit.

In the South.—In Georgia, the middle of February, after weeks of warm weather, many of the plums coming out in bloom and peach trees just showing the pink, peach buds entirely killed and trees badly injured, yet enough buds were left alive on some of the varieties of Japan plums so that there will be quite a little crop of fruit. For two or three years, varieties like Red June, Abundance and Burbank have been shipped to the Northern markets from Georgia, and sold on an average twenty-five per cent. higher than peaches, with an increasing demand each year for the fruit. In New England they have been marketed for the last three years to a considerable extent, having sold fifty per cent. higher than peaches in the same markets—the demand always ahead of the supply. They have thick, tough skins, and are not seriously injured by the curculio. Trees will thrive on very light, thin soil, or on that quite heavy and moist. The quality of the fruit is good, and they can be kept in the market from one to two weeks after being picked from the tree, in fair eating condition.

The best sorts.—Red June, Abundance and Burbank are the most satisfactory of the well-tested varieties. Satsuma needs more maturity of tree before coming into full bearing; for, while the first three named will fruit freely two or three years after planting, Satsuma requires about five. Of the newer sorts Wickson is the largest and most attractive in appearance, while the Hale is best

in quality of all the Japans; but these two varieties and the Satsuma are extra early bloomers, and on this account more liable to be caught by late frosts in spring than some of the others. Of other well-tested sorts, Willard and Berk-mans should be rejected as far too poor in quality to be worthy of propagation. Ogon and Normand, both yellow varieties, are vigorous and productive trees, but not very high in quality. Chabot, sometimes known as Yellow Japan, Chase, etc., is a late-ripening plum of fine appearance and good quality. The Gold is a small, weak-growing tree, with fruit somewhat like the Ogon, only not so good in quality.

Many new varieties are being tested; probably some of them will prove of greater value than those we already have, and an orchardist will not go astray in planting the best ones here mentioned. Every one who owns a family fruit garden in the central Northern states makes a big mistake if he does not have a good number of these trees on his grounds, for the best of the Japan plums can be grown almost as cheaply and abundantly as the most common apples.—*Rural New Yorker*.

SOME MISSOURI EXPERIENCES.

We extract the following discussion over plum varieties from volume 42 (1899) of the Missouri Horticultural Report:

"Mr. B. (Illinois): I lost 300 trees last winter. I want to know what to replace with.

"J. H. K.: My experience in Buchanan county [Missouri] is with the native plums. Eastern and Japan are not profitable. Wild Goose is always profitable. I have the Wolf, Miner, Marianna, Pottawatomie, Marion, and Newman. Wild Goose has paid best. Wolf is a freestone; it rots. Pottawatomie I cannot market at all; too small. Arkansas Lombard is not very good. Blue Damson is one of the best of the Europeans. Wickson stood the winter; has not fruited. My Blue Damsos are all on their own roots.

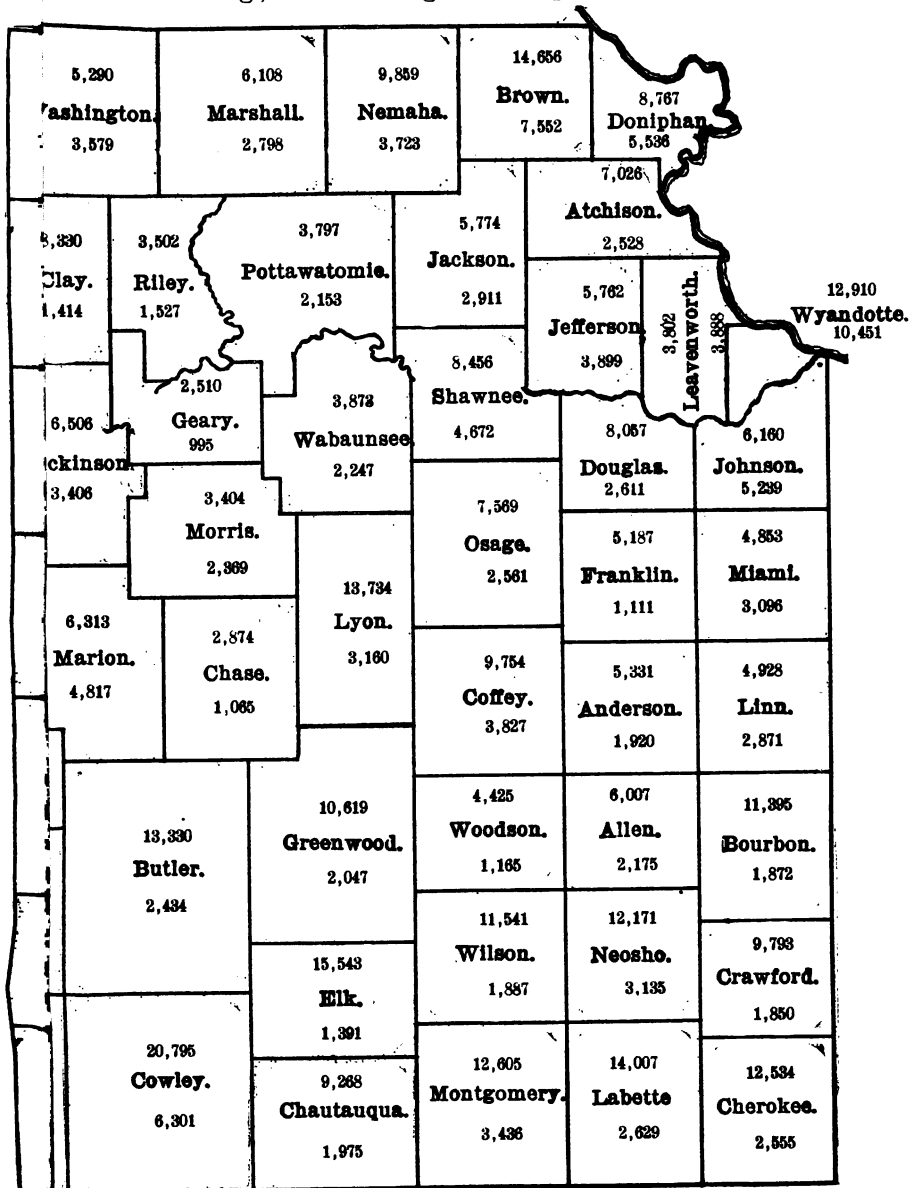
"Professor Whitten: We have about 150 varieties of American, European and Japan plums at the Missouri Experiment Station. No European is worth growing in this state. The best plums for us are the American. I would name Forest Rose, Miner, Wild Goose, Wolf, and Wyant. The latter, fruited only one year, is large and of good quality. Wayland is a good late kind, splendid keeper. Golden Beauty is yellow, small, good keeper. World Beater makes good jelly and jam. Abundance and Burbank are the best Japs. for Missouri. They rot, but not so bad as the Europeans.

"J. J. K.: I have twenty-five or thirty varieties of plums. I would name Forest Rose, Poole's Pride, Wild Goose, Pottawatomie, and Robinson, to make money. I sell Wild Goose for \$2 per bushel. The Abundance is very fine; as good as the cherries in the old country.

"Mr. B. (Illinois): I have 100 Burbank. They did not winter-kill. Abundance not so hardy. Shropshire Damson half killed. Other Europeans half killed. Wild Goose is the only native variety I grow. It gives a good crop almost every year. I have sprayed nine years for the curculio and rot; succeeded some years."

S.

trees in bearing; the lower figures the plum trees not yet bearing.



or bushes of wild or Sand plums indigenous to the soil.

THE POLLINATION OF PLUMS.

By PROF. F. A. WAUGH, Horticulturist at Agricultural College Experiment Station,
Burlington, Vt.

I. SUMMARY.

Plums are very uncertain in setting fruit. A part of this uncertainty seems to be due to lack of proper cross-pollination. To secure cross-pollination, plums of different varieties should be closely planted, or scions of different varieties should be set into the tops of trees which do not bear satisfactory crops of fruit.

Cross-pollination in plums is provided for by several natural adaptations, especially by the defectiveness of flower parts and by the sterility of certain varieties toward their own pollen.

American varieties of cultivated plums have arisen from several distinct botanical species. These varieties retain more or less the characters of the parent species, and thus may be judged to some extent by their parentage. It is thought that the botanical relationships of varieties will prove to be the best guide to their affinities in cross-pollination.

The economic characters of these groups may be generalized as follows: European (*Prunus domestica*).—Hardy, best and most salable fruit; perfect pistils, not good pollen bearers. Myrobalan.—Used as stock, but losing in favor, being supplemented by Marianna and American varieties. Japanese.—Comparatively new; relative value uncertain; several varieties practically hardy. American group.—The Western wild plum, very hardy, fruit good but inferior to European; good stocks; very delicate sexually, usually requires cross-pollination. Eastern forms (var. *nigra*) are even more hardy than western forms, range further north; stronger pistils, weaker pollen bearers. Wild Goose group.—About as hardy as Japanese plums, thought to need cross-pollination and to be weak pollen bearers. Marianna.—Probably a hybrid; sexually weak; uncertain bearer, chiefly used as stock. Chickasaw.—Of southern origin; many prolific and desirable varieties.

Eminent horticulturists and botanists agree in the general desirability of cross-pollination in plums.

Although we have gained some knowledge as to the pollination of plums, there are yet many questions of practical importance and theoretical interest open to investigation. It is hoped that this bulletin will call attention to some of these unanswered questions and direct the reader to further observation and reflection.

II. COMMON ORCHARD OBSERVATIONS.

Among the multitudinous uncertainties of fruit-growing, the production of a crop of plums presents the greatest combination of obscure and unmanageable factors. Even if a heavy crop of fruit is set, the curculio, the gouger, and the brown rot—all peculiarly hard of suppression—remain between it and the market. But there are many uncertainties in the setting of the crop. At times plum trees are so greatly overloaded with fruit that the branches may be broken to the ground. Other varieties, or the same varieties in different localities, or the same trees in different years, may show hardly any fruit. Moreover this condition of varying fruitfulness is largely independent of the crop of blossoms which the trees may produce. Plums are notably prolific bloomers; yet many trees are loaded with blossoms year after year without the smallest result in fruit. A crop of plum blossoms is no satisfactory indication of a crop of plums.

These are matters of common remark. Observant orchardists have long ago learned to shun unproductive varieties and to destroy the more nearly sterile trees. More recently it has become customary to refer cases of total or partial sterility to lack of cross-pollination, and, proceeding on this theory, mixed planting and the intergrafting of different varieties have been frequently advised and practiced. Cases which lend support to this theory will occur to every horticulturist. Mr. L. M. Macomber, of North Ferrisburgh, Vt., has a tree of naturalized plum from Minnesota (the typical *P. americana*), which blossomed heavily each spring but did not bear a fruit for several years. Later a tree of Lawrence variety standing near it began to blossom. The first year after the blossoming of the Lawrence, and each succeeding year, the Minnesota plum bore heavy loads of fruit. Similar cases could be cited indefinitely.

III. CROSS-POLLINATION AND FRUITFULNESS.

The influence which cross-pollination is assumed to have in the increased number of plums set in certain cases is analogous to that which has been shown to exist with many other plants. Cross-pollination (or cross-fertilization) is associated in the popular mind with the production of wonderful new varieties of fruits, flowers, and vegetables—with hybrids and colored plates and fruit-tree agents. But in the light of more thoughtful study it seems doubtful whether this is the chief role which nature intended for cross-pollination, or whether, indeed, it is a natural role at all. It seems rather that cross-pollination has its best usefulness in its immediate effects in provoking certain flowers to bear fruit which otherwise would have been abortive, or in stimulating certain fruits to a more perfect development than they would attain through self-fecundation. Waite has

recently shown the importance of cross-pollination with certain varieties of pears; and the same author says: "Apples are more inclined to be sterile to their own pollen than pears. With the former, in the great majority of cases, no fruit resulted from self-pollination." Beach has shown that several varieties of grapes are more or less self-sterile, and Green has added some useful notes in the same line. Bailey asserts that our native plums "do not fertilize themselves"; and the experiments of Heideman with varieties of *P. americana* indicate not only frequent self-sterility but also a remarkably capricious selective affinity among certain varieties. It is in the A-B-C of strawberry culture that certain varieties normally bear pistillate blossoms which require pollination from other varieties, and that certain other sorts are particularly useful for the quantity and prepotency of their pollen. It seems possible, or even probable, that when we have gone a little deeper into the question of the pollination of apples, pears, and plums, we will designate their sexual capabilities and affinities as positively as we do now those of the strawberry. It is evident that when our knowledge of these fruits gains that degree of exactness we will have made a great advance in pomology. In the meantime we may regard it as the soundest practice to plant plum trees thickly together and to see that the varieties are well mixed.

IV. CROSS-POLLINATION IN PLUMS.

Cross-pollination is advantageous to many varieties of plums and necessary to at least a few. This preference for foreign pollen is not confined to the blossoms of cultivated varieties, but shows itself quite unmistakably in many wild plums. The aboriginal forms of *P. americana* seem to be especially delicate in their capabilities of fecundation. To meet this need plums do not naturally depend alone on the chance transfer of pollen by insects or wind, but cross-pollination is provided for and self-pollination is provided against by various interesting modifications of the typical flower.

The form of the flower may be changed. There are possible six distinct variations. In two of these the pollen and stigma mature at different times; in two forms the pistils are either much shorter or much longer than the stamens; and in two the flowers are sexually imperfect, one or the other of the essential organs being defective.

Any one of these arrangements in a blossom usually renders it incapable of self-fecundation. It is probable that each of these six forms occasionally appears in plum blossoms, particularly in varieties of the *americana* group, but aside from the one bearing imperfect pistils, I am inclined to believe that these diversities have little immediate significance. They may be of some slight interest to theoretical biology in throwing some light on questions of evolution, but

they are so infrequent as to have no perceptible influence on the fruit crops. The several special modifications would need to be much more uniform in their occurrence than I have found them before they could be considered a safe guide to the affinities of varieties for cross-pollination, as suggested by Mr. Heideman. The efficacy of these various forms in securing cross-pollination is yet awaiting demonstration.

Without reference to adaptations for cross-pollination, it is to be remarked that the species *P. americana* is exceedingly variable in all its characters, especially in its flower parts. Mr. Heideman mentions a tree in his orchard which uniformly bore flowers with twin ovaries, or even with three united ovaries in a single blossom; and a case of the same sort has come under my own observation in a scion of a Minnesota seedling in the orchard of Mr. L. M. Macomber.

The defectiveness of pistils in many blossoms, however, seems to me to be a more serious matter. It is of much more frequent occurrence, and appears to represent, in a majority of cases, a diseased or atrophied condition of the pistil, rather than a healthy modification of form. Professor Goff, who has given this question diligent study, is inclined to attribute many cases of defective pistils to inclemencies of climate, and an examination of the abortive organ itself would give that idea rather than the notion of a definite evolutionary modification. However, the theory of damage from cold weather is not supported by the notes which we have collected, as will appear later.

With a view to gaining some light on these questions, a large number of plum blossoms have been examined this spring. While the number of blossoms examined from any single sample was too small to warrant any dogmatic judgment of the variety represented, the total number of blossoms examined (about 2000), and the careful manner in which the work was done, under the microscope in the laboratory, will justify us in making some generalizations from the whole. The record of these laboratory examinations will be subsequently published in an annual report.

The term "defective pistils" in this bulletin includes all imperfections which evidently would make fecundation impossible. In very many cases no trace of style or ovary was found. In many other blossoms a small, rudimentary pistil was present, which had plainly ceased to have any vital significance. These several defects seem, for the most part, to be only degrees of the same weakness, whether that weakness be sexual invalidity, evolutionary adaptation, the result of severe weather, or something else. In the aggregate the defective pistils are numerous enough to be taken into serious consideration.

In the laboratory examinations several samples showed 100 per

cent. defective pistils. Obviously no crop can be expected from trees which these samples fairly represent. Cases in which trees fail to set fruit after being loaded with blossoms will be remembered by every horticulturist. Doubtless many such instances of sterility occur through lack of pistils. The Marianna is notably a shy bearer. Its record, as shown in table 1, seems to show a reason. Its evident sexual weakness may also be some confirmation of its hybrid origin.

The differences in the average percentages of defective pistils in the several groups cannot be regarded as purely accidental. The comparison may best be seen in table 1.

Table 1.—Comparison of Groups.

GROUP.	Samples.	Total blossoms.	Per cent. defective.
<i>Prunus americana</i> varieties.....	60	550	27.8
“ “ type, wild.....	7	85	40.0
“ “ var. <i>nigra</i>	6	53	5.7
“ “ consolidated.....	73	688	27.6
<i>Prunus chicensa</i>	17	159	15.1
<i>Prunus hortulana</i> varieties.....	18	171	24.6
Marianna.....	4	46	50.0
<i>Prunus domestica</i> varieties.....	30	292	5.1
<i>Prunus triflora</i> varieties.....	9	72	15.9

From this it appears that about one-half of the pistils of the Marianna were defective, over one-fourth in *P. americana* (the common wild plum), only a little less in *P. hortulana* (the Wild Goose group), about one-sixth in the Chickasaws and Japanese plums, and only one-twentieth in the European varieties (*P. domestica*). The great discrepancy between the wild forms of the typical *P. americana* (mostly Western) and the variety *nigra* (mostly Eastern) is a point of considerable interest. Besides furnishing another character in justification of a division between the two forms, it gives a valuable hint to those who are looking for new garden varieties. It is worth remarking, however, in this connection that the variety *nigra* does not bear so much pollen as the type forms.

Some of the individual records in the laboratory examinations are open to more or less explanation. For example, Mr. Munson writes concerning a Wild Goose seedling (*P. hortulana*) which showed 87.5 per cent. defective pistils: "It is only two years old from seed, and is flowering for the first time. It is my experience that almost invariably varieties, when they begin to bloom, set little or no fruit. As they get age, some become very fruitful, while others always fruit scatteringly. The youth of this tree, I think, fully accounts for the defectiveness of the female parts." It seems impossible, however, with present data, to find any constant connection between defective-

ness of pistils and conditions of soil, cultivation, or climate. It should be noted that the same tree varies from year to year. The pistils may be all defective one year, and all sound the next.

Different varieties vary greatly in the amount of pollen produced. This variation seems also to follow somewhat the specific parentage of the varieties. Thus, plums of the *americana* group are generally more abundant pollen bearers. The Chickasaw plums are rather weaker pollen bearers, though they seldom show serious deficiency. The Japanese plums are still weaker, while the Marianna is distinctly lacking in the quantity and perhaps also in the quality of pollen produced. A comparison of the several groups as pollen bearers is made in table 2.

Table 2.—Comparison of Groups

In the matter of pollen bearing. Figures indicate the number of samples under each rating.

Group.	Scant.	Medium.	Abundant.	Very abundant.
<i>Prunus americana</i> (consolidated).....	7	23	20	10
<i>Prunus chicasa</i> varieties.....	5	6	3	0
<i>Prunus hortulana</i> varieties.....	2	11	3	2
Marianna.....	3	0	0	0
<i>Prunus domestica</i> varieties.....	6	7	7	0
<i>Prunus triflora</i> varieties.....	4	4	0	0

In connection with any estimates on the point of comparative pollinating efficiency several things have to be taken into account. In the first place, any estimate of the quantity of pollen borne must necessarily be very rough. In the second place, there may be a difference in the quality of the pollen. I have examined some samples in which many imperfect grains could be noted with a low-power lens. In other samples apparently well-formed grains would fail to respond to micro-chemical tests for protoplasm (Millon's reagent), leaving a strong presumption against their ability of fecundating the ovules. But above all this, the pistils of many varieties appear to have a pronounced selective ability, whereby they refuse certain pollen while receiving readily pollen from some other source. Our knowledge is very imperfect on all these points, but we know enough to make us very cautious how we dogmatize about this question. Much more careful field experimentation is needed along these lines.

In order to gain some evidence on the point raised by Professor Goff and others, that the severe northern climates are accountable for much of the defectiveness of plum pistils, table 3 has been prepared.

The different locations are arranged in the table, as far as practicable, in the order of their geographical latitude. The testimony of the table is not very emphatic, it is true, but it does not sustain the

conjecture. Aside from a uniformly high percentage of defective pistils at Madison, Wis.—Professor Goff's own location—the percentage rather decreases than increases northward.

Table 3.—Comparison of Localities.
Percentage of defective pistils.

LOCALITY AND DATE OF FLOWERING.	<i>Prunus americana.</i>					<i>Prunus chicasa.</i>		Wild Goose	Marianna
	Wild.....	De Soto ...	Weaver....	Wyatt.....	Wolf	Robinson..	Pottawa- tomie.....		
Denison, Tex., March 24.....			75					25	
Stillwater, Okla., March 31.....	50							10	
Manhattan, Kan., April 13.....	40		0	0		20			
St. Louis, Mo., April 14 and 21.....	56							0	
Morgantown, W. Va., April 22.....	0*								
Pennsylvania State College, April 25..	0*								
Amherst, Mass., May 4.....	0		0		30		0		67
Michigan Agricultural College, May 1..		10			22		0		
Geneva, N. Y., April 30.....		0							
Madison, Wis., May 2.....	90			60	56	29	0	9	100
Minnesota City, Minn., May 1.....		14	0	28	37				
Burlington, Vt., May 8.....	0*	16			10	0	50		0
Orono, Maine, May 19.....					0				17
Ottawa, Canada, May 10.....	0	10		10					

* Var. *nigra*.

The first, and perhaps the chief, practical question to be settled is: What varieties, under ordinary circumstances, are fertile with their own pollen, and which are self-sterile? A large number of blossoms in the orchards of Mr. L. M. Macomber, North Ferrisburg, Vt., were covered with paper sacks, in order to protect them from cross-pollination. The results from these are shown in table 4.

Table 4.—Record of Protected Blossoms.

VARIETY.	Approximate number of covered blossoms.	Fruits set.	Crop set on remainder of tree.
De Soto	25	0	Moderate.
De Soto, Wrong	75	0	"
Original Minnesota	100	0	"
Minnesota	100	10	"
Minnesota Seedling No. 2	250	6*	Full.
" " No. 3	80	4*	"
Pottawatomie.....	200	0	Light.
Robinson	60	8	Moderate.
Rollingstone.....	200	0	Full.
Wolf	200	9	Moderate.
Wolf Seedling No. 5	75	5*	Full.
" " No. 6	300	0	"
" " No. 7	125	6*	Moderate.
" " No. 2	100	4*	Full.

* Weak.

The range of varieties in this series of experiments is barely large enough to be suggestive, although the large number of blossoms covered and the relatively small number of fruits set give a satisfactorily clear-cut indication of a generally prevalent self-sterility. It seems clear that one could expect little fruit from De Soto, the Original Minnesota, Pottawatomie, Rollingsstone, and the Wolf Seedling No. 6, unless the trees were favorably situated for cross-pollination. In fact, Robinson was the only variety in the experiment with which the fruit set by self-pollination seemed to be normal and vigorous. Our judgments, made in the orchard—and such judgments may properly go beyond the numbers in the tabulations—were that self-sterility was extremely doubtful in all cases except that of Robinson.

The question which naturally comes next in order is this: If a certain variety must have foreign pollen in order to set fruit, what other varieties are the most efficacious pollen bearers? This is a question requiring very many experiments in artificial pollination. Our own work for 1896 has been limited to twenty-one experiments among eleven varieties, and consisted of 319 artificial crosses. The record of these pollinations is seen in table 5.

Table 5.—Record of Crosses.

FEMALE PARENT.		MALE PARENT.		Number pollinated.	Number set.
Species.	Variety.	Species.	Variety.		
1 <i>P. americana</i> ,	Minnesota		Cherry	13	0
2 " "	"	<i>P. americ'na</i> ,	<i>nigra</i>	35	16
3 " "	"	"	"	9	*...
4 " "	"	"	"	22	*...
5 " "	"	"	"	26	19
6 " "	"	"	"	20	2
7 " "	"	"	"	12	9
8 <i>P. chicasa</i>	Robinson	"	Minnesota	16	6
9 " "	"	"	Rollingsstone	22	*...
10 " "	"	"	Wolf	14	1
11 <i>P. americana</i> ,	De Soto	"	"	12	†...
12 " "	"	"	Marianna	14	†...
13 " "	"	"	Rollingsstone	14	†...
14 " "	"	"	"	27	†...
15 " "	"	"	<i>nigra</i>	6	†...
16 <i>P. chicasa</i>	Robinson	"	"	9	0
17 <i>P. americana</i> ,	Wolf	<i>P. domestica</i> ,	McNiel	10	0
18 " "	De Soto	<i>P. americ'na</i> ,	Wolf Seedl'g.	8	*...
19 " "	"	<i>P. domestica</i> ,	McNiel	5	1
20 " "	Wolf Seedl'g.	<i>P. americ'na</i> ,	Hawkeye	9	*...
21 " "	De Soto	"	Wyant	16	6

* No record. † Tree died.

Beyond an indication that the typical Western forms of *P. americana* can be pollinated by the Eastern forms (var. *nigra*), these experiments show nothing. No one who has had experience in hand

pollinations will be surprised at the irregularity of results, nor at the comparatively small number of fruits set.

V. BOTANICAL RELATIONSHIPS OF CULTIVATED PLUMS.

Within the past few years it has become customary among nurserymen and fruit-growers to refer all cultivated plums to the botanical species from which they are severally supposed to have sprung. This method has many obvious advantages. The cultivated varieties of each group have many important characters in common, so that the fruit-grower soon finds himself able to form a very good and useful estimate of any new variety as soon as he knows its botanic origin. However, with the rapid introduction of new American varieties, the botany of cultivated plums has become much more complicated. Botanists have found it necessary to make new species of recently discovered forms, and as varieties of these forms have been introduced to cultivation horticulturists have had to keep pace with botanical study in order to maintain an acquaintance with the fruits in their gardens. In the foregoing tables the different varieties are referred to their botanical parentage as accurately as could be done at this time. For the most part the dispositions made of the several varieties are those generally accepted. A few are questionable, but it was thought better, in cases of doubt, still to place the doubtful variety in the group to which it seems to belong, rather than to throw such varieties into a mixture by themselves.

When Mr. Andrew J. Downing wrote his "Fruit and Fruit Trees of North America," he recognized only three species of plums as concerned in the parentage of our cultivated varieties, namely: *P. domestica*, the European plum; *P. americana*, the American red or yellow plum; and *P. chicasa*, the Chickasaw plum. Since then the classification has been so much complicated, both botanically and horticulturally, that it requires some critical attention to understand the subject. It is thought the more wise to take up here the botanical classification of plums, because the limits of cross-pollination and the lines of affinity among varieties may well be supposed to follow very closely the true botanical boundaries of the parent species. The natural relationships of the various groups are shown in the following:

Conspectus of Cultivated and Native Plums.

Family ROSACEÆ; genus *Prunus*.

FOREIGN SPECIES.

P. domestica L. COMMON EUROPEAN PLUM. Probably originally from Asia. Flowers showy, white, more or less fascicled; leaves large, ovate or obovate, usually firm and thick in texture, very rugose, usually pubescent beneath, coarsely serrate; shoots usually downy; fruit very various, of many shapes and flavors, but mostly globular-pointed or oblong; the stone large and slightly roughened or pitted.

P. cerasifera Ehrh. MYROBALAN OR CHERRY PLUM. Differs from the last in a more slender habit, often thorny; flowers mostly smaller; leaves smaller, thin, smooth, and finely and closely serrate; fruit globular and cherry-like, ranging from the size of a large cherry to over an inch in diameter, with a depression about the stem, in various shades of red or yellow.

P. triflora Roxb. JAPANESE PLUM. A strong growing tree, perhaps native to China, numerous varieties of which have recently been disseminated in the United States. Flowers usually densely fascicled; leaves and shoots smooth and hard, the former obovate or oblong-obovate, prominently pointed, and finely and evenly serrate; fruit usually conspicuously pointed, red, yellow, or purple, with a very firm flesh and commonly a small stone.

NATIVE SPECIES. (TREES.)

P. americana Marsh. COMMON WILD PLUM. The type distinguished by entire calyx lobes, which are pubescent on the inner surface; stone turgid; leaves oval or slightly obovate; petioles mostly without glands. Tree spreading, ragged, thorny, 8-20 feet high; flowers large, white, on slender pedicels; leaves very coarsely veined, never glossy or shining; fruit more or less flattened upon the sides, firm and meaty, the skin tough and glaucous and never glossy, ripening through yellow to red. Occurs wild from New Jersey and New York to Montana and Colorado. It varies southward, in Texas and New Mexico represented mostly by the variety *mollis*.

Var. *mollis* Torr. & Gray. Has the leaves and pedicels pubescent, especially when young.

Var. *nigra*. CANADA PLUM; RED PLUM. [*P. nigra* Ait.; *P. americana* T. & G. and 6th ed. Gray's Manual.] In its extreme forms easily distinguished by the glandular-serrate calyx lobes, glabrous on the inner surface; compressed stone; broadly oblong-ovate to obovate leaves, with petioles bearing two glands. Flowers large, white, with short, thick peduncles conspicuously marked by the scars left by the falling of the bud scales; pedicels dark red, slender, glabrous; calyx tube broadly obconic, dark red on the outer and bright red on the inner surface; fruit oblong-oval, orange-red; stone nearly oval, compressed. Occurs wild from Newfoundland west to Rainy and Assiniboin rivers, in Canada, and commonly in the New England states, where it is found along roadsides and in waste places.

P. hortulana Bailey. WILD GOOSE PLUM. A strong, wide-spreading, small tree, with smooth, straight twigs, and a peach-like habit; flowers rather small, often very short-stalked; leaves narrow ovate or ovate-lanceolate, thin and firm, flat, more or less peach-like, smooth and usually shining, closely and obtusely glandular-serrate; fruit spherical, bright colored and glossy, lemon yellow or brilliant red, the bloom very thin, juicy, with a clinging, turgid and roughish, small, pointed stone. Occurs wild in the Mississippi valley in the neighborhood of St. Louis.

Var. *mineri* Bailey. Differing more or less from the species by the dull and comparatively thick leaves, which are conspicuously veiny below and irregularly closely toothed and more or less obovate in outline, and by a smoother and more *americana*-like stone.

Hyb. *marianna*. This plum is thought to be a hybrid between the Myrobalan and the Wild Goose. (L. H. Bailey, Cornell Exp. Sta. Bull. 38, p. 32.) Perhaps one or two other varieties have a similar origin.

P. chicasa Michx. [Properly *P. angustifolia* Marsh.] CHICKASAW PLUM. Slender tree, 12-20 feet high; slender, zigzagged twigs; smaller, lanceolate or

oblong-lanceolate leaves, which are very closely and finely serrate, shining, and trough-like; fruit small, very early, red or rarely yellow, the skin thin and shining and covered with many small, light dots and a very thin bloom; the flesh soft and juicy, often stringy, closely clinging to the small, broad, roughish stone. Wild from Delaware south and west to east Kansas and Texas.

P. alleghaniensis Porter. SLOE. A small, slender tree or shrub 3-15 feet high; leaves lanceolate or oblong-ovate, often long acuminate, finely and sharply serrate, softly pubescent when young; fruit dark purple, with a bloom. Alleghany mountains, in Pennsylvania.

P. subcordata Benth. A small tree 20-25 feet high; leaves broadly ovate or orbicular, usually cordate, sharply and often doubly serrate, slightly coriaceous, dark green on the upper and pale on the lower surface; flowers in 2-4 flowered umbels on slender pedicels; calyx lobes oblong-obovate, rounded at the apex, half as long as the white petals; fruit oblong, dark red or purple or sometimes yellow. Pacific coast species.

P. umbellata Ell. BLACK SLOE; HOG PLUM. A small, bushy tree; flowers on slender pedicels nearly an inch long, rather large, white; leaves smallish, ovate or slightly obovate, or sometimes short oblong, thin and dull, closely and evenly serrate; fruit about three-fourths inch in diameter, yellow or reddish, flesh firm and austere; stone short and turgid, cherry-like. Seashore from South Carolina to Florida, and westward to Mississippi, Louisiana, and Arkansas.

NATIVE SPECIES. (SHRUBS.)

P. watsoni Sargent. SAND PLUM. A shrub 6-10 feet high; leaves ovate, acute, rounded or wedge-shaped at the base, finely crenulate, serrate, lustrous on the upper and pale on the lower surface; petioles slender, grooved, biglandular at the apex; flowers in crowded, few-flowered fascicles; calyx cup-shaped, the lobes acute, rounded at the apex, without glands, ciliate on the margins, pubescent on the inner face; petals inserted remotely on the glandular disk, narrowly obovate, rounded and more or less erose above, contracted below into short claws, pure white; fruit globose or rarely oblong, orange-red. Sandy streams and hills, south and southeast Nebraska and central and western Kansas.

P. gracilis Engelm. & Gray. A small shrub, 1-4 feet high; soft pubescent leaves, oblong-lanceolate to ovate, acute, sharply serrate, becoming nearly glabrous above, 1-2 inches long; pedicels and calyx pubescent; fruit less than one-half inch in diameter; stone rather turgid, suborbicular. Prairies and sandy places, south Kansas to Texas and Tennessee.

P. maritima Wang. BEACH PLUM. Low straggling shrub, 1-5 feet high; leaves ovate or oval, finely serrate, softly pubescent underneath; pedicels short, pubescent; fruit globular, purple or crimson, with a bloom, one-half inch in diameter; stone very turgid, acute on one edge. Sea beaches, New Brunswick to Virginia. Some distance from the coast has leaves smoother and thinner, and fruit smaller.

Remarks upon Botanical Groups.

EUROPEAN [*domestica*] GROUP. The cultivated varieties of the European plum bear the best and most salable fruit. They are generally hardy in most sections of Vermont, though most of the 1896 crop was killed by the severe winter weather. The pistils in varieties of this species are uniformly larger and stronger than in other species, and are practically never defective. These varieties are usually deficient pollen bearers, but their need of cross-pollination has not yet been clearly shown, nor their best pollenizers pointed out. Pistils and anthers

appear to mature at the same time, and heterostyled or bisexual forms are seldom or never found.

MYROBALAN. This plum has been extensively used as a stock, but has been rapidly losing favor, the Marianna or seedlings of *P. americana* being generally substituted.

JAPANESE PLUMS have not yet been long enough known [1896] in the United States to have found their final position in our estimation. They are an important and desirable acquisition. Several varieties have been planted in Vermont, and, for the most part, are sufficiently hardy to justify their planting. Abundance usually fruits here, bearing heavy crops. All blossoms of Japanese varieties, however, were killed by cold weather during the winter of 1895-'96. They seem to be considerably weaker in their pistils than varieties of the *domestica* group, but this does not interfere with their fruitfulness.

AMERICANA GROUP. The plums of the *americana* group resist cold much better than any others. They are the hardiest we have. *Americana* varieties now hang loaded with fruit beside the Japanese, *domestica* and Chickasaw varieties, which are entirely bare. They are to be especially recommended for planting in cold and exposed localities, where the *domestica* varieties are uncertain. In general the fruit is inferior to that of the *domestica* varieties, although many of the best sorts are very acceptable on the table and quite salable in the market. *Americana* seedlings seem to make good stocks for working varieties of the *domestica* and other groups. Wild and cultivated forms of this group are peculiarly delicate in sexual organization, to an extent which sometimes interferes materially with the crop. Most varieties probably require cross-pollination. The blossoms themselves make provision for this by numerous contrivances, the most efficient of which are proterogyny, the suppression of pistils, and the selective power of the pistils in receiving pollen.

The variety *mollis* of *P. americana* is represented in cultivation by several horticultural forms; although the origin of the horticultural forms from the botanical variety does not seem to be necessary, but rather doubtful in some cases. The leaves and pedicels, especially in cultivated varieties, are found to be pubescent in all degrees, and it is quite possible for a distinctive degree of pubescence to appear as a garden character, although the variety might be genetically referable to the smooth type. Several varieties not usually put in this section of the *americana* group are quite pubescent enough to be so classified. The southern distribution of this botanical variety might raise a question as to whether or not it is as hardy as the type when planted northward.

The variety *nigra* of *P. americana* is here proposed in place of Aiton's *P. nigra*, and in order to satisfy the necessities of horticultural and botanical intercourse. Gray's Manual of Botany combines all these diverse forms under one name. Professor Bailey's recent revision of "Field, Forest and Garden Botany" does the same, and in his paper on "The Cultivated Native Plums and Cherries" Professor Bailey says, speaking of the characters used to distinguish *P. nigra* from *P. americana*: "I am unable to find any constancy in these characters. . . . I am obliged, therefore, . . . to unite *P. nigra* with *P. americana*. This I regret the more because it is undoubtedly true that there are two well-marked wild varieties—possibly species—passing as *P. americana*." It is evident that we must have some way of conveniently designating such an important difference, and the application of the name *P. americana*, var. *nigra*, seems to me to dispose of the case in best accord with the natural relationships on the one hand and with our acquired habits of nomenclature on the other.

The variety *nigra* is even more hardy than the species, ranging much further northward; its pistils are much stronger and more regular in their development; it bears pollen somewhat less abundantly, and whereas the species has a tendency to be protogynous, Professor Sargent characterizes the variety (which he calls *P. nigra*) as protogynous. This point was not satisfactorily verified in our own examinations this spring. This is the common wild plum of Vermont and neighboring states.

WILD GOOSE GROUP. The plums of the Wild Goose group do not seem to have been generally tried in Vermont. They are usually quite as hardy as the Japanese varieties, and are well worth a trial. The Wild Goose and its most closely related varieties are commonly said to need cross-pollination, and to be themselves weak pollen bearers. Weaver and other *americana* varieties have usually been recommended as pollenizers, but it would be worth while to determine whether or not certain other varieties of *P. hortulana* which bear abundant pollen are not better for this purpose.

MARIANNA PLUM. Sexually weak to a marked degree, it is always regarded as an uncertain bearer, and large crops from it are quite exceptional. Its affinities in pollination are extremely problematical. At the present time it is most useful as a stock. It grows readily and vigorously from cuttings set in the open ground; it buds or grafts easily; the unions form readily, and are apparently lasting. To a great extent it has superseded the Myrobalan as a stock. Although of Texas origin, it seems to be perfectly hardy in this state.

CHICKASAW. The name *P. chicasa* is retained in place of *P. angustifolia*, which is technically the correct one for the Chickasaw plum, on account of its familiarity to horticulturists and botanists, and because it is used in Gray's Manual and in "Field, Forest and Garden Botany." These plums form an attractive group, some of the varieties being very prolific and excellent for the table. Although some varieties are sufficiently hardy to make them desirable in Vermont plantings, they are, as a group, better adapted to warmer localities. They do not show, so far as our own study has gone, any special adaptations for cross-pollination.

The *P. alleghaniensis* has not been introduced to cultivation, and is quite restricted in its range. *P. subcordata* is not known east of the Cascade mountains. "In Oregon and northern California the fruit is collected and consumed in large quantities, both fresh and dried, and is used for preserves and jellies." It is also used as a stock for European plums. *P. umbellata*, locally known as the Hog plum, is known only wild. "The fruit is gathered in large quantities, and is used in making jellies and jams."

THE DWARF SAND PLUM, until recently, has been put into the Chickasaw group, which it most nearly resembles. It is, however, quite distinct; and in 1894 Professor Sargent set these peculiar forms off from *P. chicasa* with the name *P. watsoni*. The points of distinction are given in the description, on a preceding page. The wild bushes of this species bear abundant crops of superior fruit. The plums are eagerly gathered and used in preserves or jellies. Some few varieties have been propagated and introduced, as the Bluemont, by Prof. E. Gale, of Manhattan, Kan., but they have thus far received only local notice. This species, as it grows wild along the Republican and Arkansas rivers in Kansas, is attractive in so many particulars that it would seem very strange did it not eventually achieve some horticultural distinction. Some experiments have been made with these plums as dwarf stocks, but no definite results have been reported. *P. gracilis* bears fruit rather sparsely, and of small size and comparatively in-

ferior quality. However, it is sometimes gathered, as I have known it to be in Oklahoma, and made up into jellies.

THE BEACH PLUM, *P. maritima*, is cultivated both as an ornamental plant and for its fruit. In the former capacity it is quite desirable; in the latter it is of little importance.

THREE OTHER SPECIES of plums, namely, *P. rivularis* Scheele, *P. glandulosa* Torr. & Gray, and *P. minutiflora* Engelm., are listed by Coulter as appearing wild in the United States; but although the fruit of the first is said to be excellent they are practically unknown to us.

With this wonderful array of native plums before us, many of which, though bearing excellent fruit in nature, have never been tried in cultivation, we may well believe that we have seen hardly the beginning of the cultivated plums in America.

POLLINATION.

By GEORGE COTTE, Horticulturist at the Oregon Experiment Station.

The first step toward successful fruit culture is an orchard wisely planted. The several varieties must be so located that they may assist in the pollination of one another. This can only be done by a careful study as to the time of blooming of different varieties and the amount of pollen produced by each variety. Very careful observations and notes were taken on all varieties on the college farm. It will be understood that all varieties of fruit-trees do not have the same power of producing pollen. If a large number of trees of a single variety be planted which are shy pollen producers, the lack of pollen will undoubtedly cause a failure in the crop of fruit; and this danger of failure will be greatly increased if the weather is damp at the time of blooming.

The pollen is conveyed from flower to flower by bees and other insects. Their object is the discovery of honey; and while searching the recesses of the flower they unintentionally cover their bodies with pollen, which they convey to the next flower and unavoidably deposit on its stigma. If the amount of pollen produced is small, there will be but a small amount to distribute, and the fertilization would be either a failure or imperfect. This shows the necessity of planting trees which are shy producers of pollen along with those rich in pollen. Hence, to arrange the trees in an orchard, we ought to know the pollen-producing power of each variety. But this is but a beginning of work which must be continued through a series of years. We have many varieties on the college grounds which have not yet come into bearing, and hence are not reported.

SOME NOTES ON POLLINATION.

Col. T. W. Harrison, of Topeka, set out carefully, some years ago, an orchard of choice plum trees. When they came into bearing, he found near the center of them a tree of the sloe—said to be the original plum. At blossoming time this sloe was always a perfect bouquet. It was a vigorous, well-grown tree at all times, and the plum grove bore splendid crops. As the trees became older they began to crowd, and the colonel concluded that it was necessary to thin them out. The sloe seemed to take up more room than any other, and the fruit was very small and practically worthless, so he naturally grubbed it out first and dragged it to the wood-pile, and he declares that the entire orchard never in any one year thereafter yielded as much as a peck of plums. Do not get sentimental and imagine the trees were in mourning for their fallen consort; they simply could not bear without the potent pollen of the vigorous sloe. Thus the apparently profitless sloe was as valuable as all the others together. Twentieth century science and horticultural education will teach us how to propagate, how to plant along sure lines, whereby we can literally “count our chickens [fruits] before they are hatched.”—SECRETARY.

FERTILIZING BARREN PLUM TREES.

Mr. J. L. Irwin, a Kansas fruit-grower, says that an uncle of his “had a clump of plum trees which were, to all appearances, healthy, mature trees. They blossomed freely each spring, but never had fruit, until upon investigation it was found that the blossoms lacked fertilizing pollen. As an experiment, a wild plum tree that was just in blossom was cut and brought to the orchard, where it was set up in a barrel of water in the midst of the heretofore barren trees. The experiment resulted in an abundance of fruit. The wild tree furnished the fertilizing pollen which the other trees did not supply.”

PLUMS THAT BLOOM BUT DO NOT BEAR.

Plum growers in many localities, and under widely varying circumstances, have found that a heavy showing of blossoms is sometimes strangely followed by no plums at all. In many cases where all other conditions have seemed to be favorable, this has been thought to be due to the self-sterility of the blossoms and the lack of cross-pollination. Repeated experiments made by the Vermont station and by various plum growers, and a great number of field observations, have shown that this is indeed the fact, and that plums are often quite incapable of developing any fruit unless the blossoms are cross-pollinated. Mixed planting and intergrafting are the remedies for this difficulty.—*Montana Fruit Grower*.

STERILE BLOSSOMING PLUMS.

I notice in the New York *Tribune*, September 13 [1899], that the agricultural department claims that all plums except Robinson have sterile blossoms; also that the different varieties bloom in the same order everywhere, though the time

of bloom varies in different sections. According to the department, different sorts which blossom at the same time must be planted near one another in order to get a full crop of fruit.

Some forty years ago, when I was a boy, the old Blue Damsons bore abundantly where no other sorts were within half a mile. I frequently see isolated trees of the Lombard and Moore's Arctic overloaded with fruit. To show that the order of bloom is not the same everywhere, I have only to compare the plum-blossom chart of J. W. Kerr, recorded at Delon, Md., with my record here in eastern Maine. Burbank, April 9; Ogon, April 12; Chabot, April 13; Willard, April 17. This is from Mr. Kerr's chart, and gives the time when the first blossoms of the sorts mentioned open.

The following is from my record of 1898: Willard, May 13; Ogon, May 14; Burbank, May 15; Chabot, May 21. The order of bloom varies throughout the long lists from which I have selected.

I do not think growers will always find results satisfactory when the self-sterile sorts are planted with other varieties blooming at the same time. I have the Ogon, which is self-sterile, within eight feet of the Red June, and near other sorts that bloom at the same time, and yet they have never produced half a crop. During the past six years, these Ogons have never failed to give a heavy bloom. In some instances where nearly the whole top is Red June, the remaining Ogon branches fruit fairly well. I have several Burbanks near the Ogon and Red June, some of which bore well the past season, and some failed apparently without any reason. The past season, on my grounds, the Chabot (Bailey) blossomed about a week later than any other sort, and yet these trees are loaded, which indicates they are not self-sterile.

In my humble judgment, based on years of experience and observation, our unfavorable winters have half as much to do with these plum failures as self-sterility.—*Chas. A. Miller, East Union, Me.*

SOME NOTES ON THINNING.

Here are three sensible items about thinning fruit on the trees:

THINNING FRUIT.

I wonder how many of you practice the thinning of fruit on your apple trees. Now, apple trees will do a good deal if you do nothing for them. But the man who wants good apples—apples that will pay—in the future will practice thinning his fruit. I should take a young tree which attempted to produce 100 apples and remove at least fifty of them, leaving not more than fifty to ripen. The next year, if it attempted to produce 200, I should leave 100 or less, and the next, if it had 1000 apples I should leave 300 or 400 only. By this method I should get that tree into the habit of annual bearing. The man who will make fruit-growing a profitable business will thin all his fruit. A peach tree that will set 1000 peaches needs to have 600 or 700 thinned off. The commercial side of fruit-growing demands thinning of nearly all your fruits. You will get more bushels to the tree; within reasonable bounds, the more you throw away the more pounds or bushels you will have left; increased size more than makes up loss in number. In thinning Japanese plums I should leave the fruit four inches apart, and peaches from five to six inches. If you will make a practice of thinning your fruit from the trees, you will usually get four dollars for one. I have often had it increase the crop fifty per cent., and the selling price 500 per cent.—*J. H. Hale, Massachusetts.*

RESULTS IN CANADA.

The practicability of thinning fruit, and its feasibility from a commercial standpoint, have been pretty well demonstrated in the last few years. In western New York, it has generally proved profitable wherever tried. Mr. John Craig reports, in the publications of the Canadian Central experiment farm, some results in thinning peaches and plums which corroborate the notes given from Mr. Beach and others. He concludes that, when a large crop is set, thinning peaches is highly remunerative, for the following reasons: (1) It increases the weight of the yield. (2) It largely increases the size of the fruit. (3) It reduces the number of matured seeds, thereby considerably lessening the drain on the vitality of the tree. (4) It renders the crop less liable to rot. Thinning plums likewise proved altogether worth while.—*Country Gentleman*.

VALUE OF THINNING PLUMS ON TREES.

In September, in one of the best plum-growing sections, I saw an orchard of 400 trees, each of which yielded ten baskets of Lombard plums, or 4000 baskets in all, which sold at twenty-five cents, making a gross return of \$1000 for these 400 trees. I saw another orchard, not five miles away, that carried probably as large a number of baskets, but I am sure they would not realize more than fifty per cent. of the gross return of the first. The high prices scored by the first lot may be attributed to the fact that they were thinned, and the second was not. The Lombard is one of those trees which will kill itself by overbearing if it is not thinned. The fruit will, under these conditions, become small and very poorly colored, so that the smaller price for the largest number of baskets will not equal in gross return that secured from the smaller quantity of better quality obtained by thinning. Some varieties of American plums are very prolific; if allowed to bear to their full extent will in a few years destroy themselves. In the case of the Weaver plum, two trees which were not thinned for three years died at the end of that period, and two other trees, which were thinned each year, are in good health and give fair returns each year. It is, therefore, not only possible by thinning to increase the quality of the fruit, but to keep your trees in health.—*From a Quebec Pomological Society Report*.

GRAFTING THE PLUM AND CHERRY.

By PROF. N. E. HANSEN, Ames, Iowa, in Nebraska Horticultural Society report.

Root-grafting of the cherry and plum in the house during winter is considered difficult by many, but it has been practiced at the Iowa Agricultural College, at Ames, every winter for many years, with good success. For plums, one-year seedlings of our native northern plum, *Prunus americana*, are used, which are grown from pits of the best cultivated varieties of the same species, such as Wyant, De Soto, and Wolf. Seedlings should not be grown from seeds gathered indiscriminately in the woods, but only from trees growing good-sized fruit. It has been found such seedlings are better and more uniform, and there is less liability to injurious influence of stock on scion. In the last two or three winters we have also used Marianna stocks, grown.

from cuttings, for root-grafting, and secured a good stand. For cherries, imported Mazzard stocks are used. Both plum and cherry stocks are packed away in thin layers, with earth between the layers, in a cool cellar. Only one scion is used to each root; piece-root grafting does not give a good stand with the plum and cherry.

The method used is that known as "side-grafting" or "wedge-grafting," and the scion is inserted at the collar. By collar, is meant the neck or line of junction between the stem and root. The scion is cut wedge shaped at the lower end with a perfectly true and straight cut, so it will fit snugly into the incision in the stock. The length of this wedge cut, one and one-half to two inches, depends on the size of the scion, a large scion requiring a long cut. The scion should contain about four buds besides the bud at the base or beginning of the wedge cut. The stock should have a ring of bark left above the incision. No wood is removed from the incision—simply a lateral cut long enough to receive the scion, cutting about two-thirds through the stock; and care is exercised to cut across the grain slightly, so as to avoid splitting the wood. Use a sharp, thin-bladed knife; a common shoe knife does as good work as any. If the incision in the stock is properly made, the scion will be held very firmly by the natural spring or elasticity of the wood. In cutting the scion, make the inside of the wedge cut thinner than the outside, so that the scion will fit neatly; but this is often overdone, so that there is too great pressure on the cambium layer (layer between the wood and bark) for proper union. So, make the inside of the wedge cut *very slightly*, if at all, thinner than the outside. The vital point to be noticed is that the inner barks of the scion and stock must be brought together, so the union can be made when growth begins.

Some device must be used to hold the seedling firmly while making the incision. The most convenient one for the grafting bench is simply half of a barrel stave fastened at the further end with a leather hinge. At the end next the grafter a strong wire is fastened around and passed through a hole in the grafting bench and fastened to a treadle below. In this manner the seedling is held very firmly. To prevent injury to the seedling, put a strip of leather on points of contact on inner edges of the stave and on top edge of grafting bench.

Three men work best together—two to graft, and one to wind, wax, and pack. After grafting, the point of union is wound three or four times at top and bottom with waxed thread, and alcoholic plastic applied with the thumb and finger. The plastic must also be applied to the tip of the scion to prevent drying out. The grafts as waxed are run through sand so they will not stick together, and then packed away in a mixture of about one-half sand and one-half earth, in boxes,

in the cellar or cave, same as apple-root grafts, keeping the temperature as near freezing as possible, to prevent injury from the graft-box fungus. Even if frozen in the boxes no harm is done. The waxed thread is made of No. 18 knitting cotton run through melted wax onto an open drum, or hollow cylinder of wood, with a crank handle attached. The wax is softened with a little linseed oil.

Recipe for alcoholic plastic: One pound white resin, one ounce beef tallow, one tablespoonful turpentine, five or six ounces alcohol. Melt resin slowly; take from fire and add tallow, stirring constantly. When still cooler add turpentine slowly, then alcohol. Wood or methyl alcohol is cheaper than common alcohol, and, as tried at the college, seems to answer the purpose equally well. It is poisonous, and should be so labeled. If the plastic becomes too stiff to work well, put vessel in a vessel of hot water and add more alcohol. The plastic should be of the consistency of thin syrup in order to work well.

The scions are kept in boxes of dry forest leaves in the cellar; the leaves contain sufficient moisture to keep the scions in good condition. The scions must be watched and not allowed to get either too plump or too shriveled, but better a little shriveled than too plump.

With all stone fruits side-grafting is much preferable to whip-grafting. By comparing the two methods it will be seen that the side-graft has two surfaces on the scion to unite by, while the whip-graft has but one. In the nursery the side-graft can be used in the spring in crown-grafting seedlings, where the bud failed the preceding autumn. Side-grafting is also the best for all top-grafting of plum and cherry. For outdoor work, the vessel containing the alcohol plastic is set in the top of a large lantern-shaped tin box with a lamp inside. The terms "top-grafting" and "top-working" are the same, the latter being more generally used in nursery work. It is most convenient for two men to work together — one to graft and the other to apply the plastic.

Plums and cherries should be grafted before there is the least sign of starting of the buds; hence, pleasant days in March should be improved in this manner. However, they may be grafted after the buds have started, provided that the scions have started equally as much. But in general it is best to graft the stone fruits early, before the buds have started. No waxed thread is used in top-grafting. After inserting the scion, apply the alcoholic plastic to the point of union and wrap with a strip of old, thin, white muslin. The muslin will adhere to the slightly warm plastic and no thread is needed for tying. The exposed tip of the scion must be touched with the plastic to prevent drying out. The "robbers" or sprouts appearing on the stem below

the graft must be removed from time to time as they appear, so the scion will have a fair chance for vigorous growth. If this is not done the scion will make but a feeble growth, or perish altogether, from lack of nutriment.

In top-grafting young trees in the nursery it will not do to strip all the leaves appearing on the stem below the graft. All the buds for a short distance just below the point of union should be allowed to expand, in order to "draw up the sap" and cause vigorous growth. If these buds push too strongly, keep in check by pinching. As the graft grows these leaves on the stock can be gradually removed, beginning with the buds next to the graft. In top-working plums and cherries, the outer bark often becomes tough and dry, so it will not expand to make room for the deposit of new wood in June. The graft is then in danger of perishing from tight lacing, and the corset strings must be cut. Do this by slitting the bark lengthwise in several places, taking care not to cut into the wood, as this is apt to cause gumming.

The general experience in top-grafting plum trees in the nursery is not favorable. Especially is it a poor plan to top-work European varieties on natives stocks; the top outgrows the stock and is injured or blown off in strong winds. But a row of unfruitful Miner plums may be made productive by top-grafting some limbs in each tree with good varieties of *Prunus americana*, such as Wyant, De Soto, and Wolf, whose blossoms have an abundant supply of pollen to fertilize the Miner. Mr. B. A. Mathews, of Knoxville, Iowa, grows large crops of Miner and Wild Goose by planting them alternately in the row, and top-grafting some limbs in each tree with productive varieties of *Prunus americana*. At the Iowa Agricultural College good results and more abundant fruiting have been attained by top-grafting native plums.

PLUMS.

By B. B. SMYTH. Read before Shawnee County Horticultural Society March, 1900.

Native fruits are always adapted to the places where they grow. The plum is one of the most desirable native American fruits. There are only three species of plum native in Kansas, though there are a good many varieties of these species. The American Red plum is found in the timbered portions of the eastern part of the state, and is not here in its greatest perfection, this being its western limit and nearly its southern limit. The Chickasaw plum is a small tree of the southeastern and southern portions of the state. The Sand-hill plum is a shrub of the desert region, and is found in its greatest perfection in the sand-hills along the rivers of the central part of the state.

All plum trees require moisture that must be nearly equal all the year around. Stagnant water is not conducive to the health of the plum tree, neither is much water of any kind, but moist earth the year around seems to be essential. The Sand-hill plum seems to be well adapted to the climate of Kansas. It is a small, scraggly tree or shrub, often not more than two feet high, but often bears a very delicious variety of fruit. The varieties of Sand-hill plums are very numerous, perhaps equal to any other species. They are all sizes, from the size of the egg of the prairie-chicken down to that of a large bean, and their colors vary from yellow through all shades of orange to nearly a bright red, and even a purple or bluish. The pits are smooth or furry, nearly globular or flattish, and with or without a distinct crease running down one edge of the pit. They vary from sour to a delicious sweet, and it often happens that a very desirable variety may be found in abundance on certain bushes, while others near by and growing in precisely similar situations, bear only undesirable fruit.

Many experiments have been made, both at the Kansas Agricultural College and other places, to graft desirable varieties of European and Japanese plums upon our Sand-hill plum as stock, but such experiments have almost invariably proven failures. The tendency of the Sand-hill plum to sprout at the root would prevent the success of any such experiment, even though the graft succeeded, as one would soon have more of the native fruit than of the grafted variety. Experiments in grafting scions of the Sand-hill plum on stocks of the more rapid-growing kinds have not been largely tried, but would, no doubt, be desirable for many purposes. It has not been thought desirable to graft Sand-hill plums on rapid-growing stocks for the reason that the fruit of the rapid-growing kinds is usually considered superior to that of the Sand-hill plum; but the advantage to be derived from the grafts is that the flowers and fruit of the Sand-hill plum are almost always liable to develop, while the introduced varieties will only develop when the season is exceptionally favorable for that variety.

There are many enemies of the introduced species of plums in Kansas; among them may be mentioned, first, climate, second, insects. Introduced plums are natives of climates moister and less changeable than this during blossoming time. Then, too, particular species of insects that aid in the fertilization of the Japan plum or European plum, for instance, have not been introduced into this state; and the foreign plum trees not being grown here in great abundance, such insects cannot be relied upon if introduced. Foreign trees depend largely upon bees for their perfection, and we do not raise many bees.

Curculio and other insects, such as we have, do not aid in developing perfect plums, but rather have a tendency to destroy the plum. The characteristics of the Sand-hill plums are such as to ward against destruction by insects and fungi. The skin is very thick, which protects against enemies and results to a greater degree in the perfect ripening of that species of fruit.

Let some of our experiment stations try grafting some of our Sand-hill plums on the more rapidly growing plum stocks and see if the tree will not be better adapted to bearing through every season than it otherwise would. The young grafts in that case would not die for lack of sustenance; while, with the contrary method of grafting the rapidly growing plum, it does not receive sustenance enough from the Sand-hill plum stock to keep it alive.

I have a great deal of faith in the Sand-hill plum as being the best adapted to this climate of any plum in existence, and believe that experiments should be made toward finding out what kind of stock will best nourish it. If a plum tree that is not disposed to cast sprouts should be top-grafted all through its head with the Sand-hill plum, the chances are that it would bear fruit every year, as the Sand-hill plum very seldom fails to bear a crop; and, so far as my observation goes, it is not affected by the curculio as the American plum and other plums are.

NOTE.—The paper was discussed by Messrs. Barnes, Lux, Harrison, and others. The general result of the discussion was to the effect that a plum tree that is a vigorous grower but a shy bearer should not be cut down, but left to grow for the benefit to be derived from it in the pollen that will be carried from it to the other trees in the orchard, as trees which are excellent bearers are often deficient in pollen, and need to have pollen carried to them from some other tree that bears plenty of it.—SECRETARY.

MISCELLANEOUS NOTES.

We gathered the following short articles from various sources. In most cases they record actual experiences, and the plum grower will find something worth remembering in every one of them:

PLANTING TREE SEEDS.

Apple seed and plum and cherry pits can be kept in the cellar in condition to grow, with proper attention to watering. But in any ordinary dry cellar the sand gets too dry to prepare the seeds for germinating the first season. It is much safer to bury outside where they will have regular moisture and more or less freezing and thawing. It is also safe to plant these seeds and pits in the fall, if properly managed. Cover the seed at least three inches deep, in drills, by mounding two inches above the surface. Early in spring rake off the mound, leaving the seed one inch deep, with a mellow surface for a seed-bed. In this way the surface is not packed, and the plants will make larger growth the first season than we secure with spring planting.—*Prof. J. L. Budd.*

A NEW METHOD OF GRAFTING.

A friend in Oregon tells me that he has succeeded perfectly in grafting apples and plums as early in the spring as possible, when they are in a dormant condition, by the following novel method: Supposing the seedlings were planted this spring. Next spring he removes the earth to the depth of two to four inches about the crown, and having a number of scions cut the proper length and slit-
 ted, makes a slit in the crown of the stock as it stands in the ground, and slips the scion in place. Then, without tying or waxing the graft, he draws the earth carefully about the graft, packing it in firmly, leaving only the top of the graft above the ground. He does not cut off the seedling stock which he has thus grafted until the graft has grown several inches, thinking that the graft would succeed better not to remove the top of the seedling thus grafted. He tells me that he scarcely lost any grafts by this method. I see no reason why this plan should not succeed as well here, and in other places, as in Oregon, providing the soil is not too stiff and clayey. In order to succeed the soil should be in fine till, and in the cultivation given later care must be taken not to disturb the graft.—
Green's Fruit Grower.

PLUMS A PROFITABLE FRUIT.

A fruit-grower in northern Missouri related the following experience before the Missouri State Horticultural Society:

"In the spring of 1896 I planted about 500 plum trees. They are planted on very high ground, sloping sharply to the north, with West Big creek on the west less than forty rods, and East Big creek on the east less than eighty rods. The land was originally what we call oak-opening land, but the oaks had been cut many years ago, and it had grown up a second growth, which was cleared off the winter before planting. But few trees were lost, and these were reset in 1897 and again filled in in 1898, so that now there are 520 plum trees. The ground has been kept clean and well cultivated. The trees have made a good growth, and some of them will bear a few plums this year. I planted very largely of the *Prunus domestica* type, the Damson preponderating very largely, with a few of the Japans and a very few of the *americana*. I am now satisfied that if a mistake has been made at all in varieties it is in not planting enough Japans. The reason for planting so few (only about thirty) was that at the time they were planted none of the Japans, to my knowledge, had borne fruit in this county, but since that some Abundance trees have borne fine fruit at an early age. At this time the Abundance and Burbank are full of fruit, while the Satsuma, Willard and the Yellow Japan have none, although the Sutsuma bloomed full. I planted but few of the *americana*—only two or three of a kind and only a few varieties. The reason was that I do not consider them profitable here, for, while they bear abundantly, they do not command ready sale, the surplus from the scattered trees almost supplying the local demand. They do not seem solid enough to stand long shipments; they are not so rich or so good when cooked as the *domestica*, and the trees do not seem to grow or bear any better.

"From observation, I believe that the Damson will be the best *domestica* plum here for profit, and for that reason have planted more of them than of any other variety. After them are those of similar habits, and that seemingly have Damson blood in them, such as the Richland; also the Lombard, Bradshaw and similar strains have all grown and borne well here. Of the Damsons I have fifty Shropshires—fine growers, and bid fair to bear young; also fifty common Damsons. Then I have 100 of a variety of the Damson for which no distinct name is known, and never saw them anywhere except in this county. I could not find them in any of the nurseries and had to plant sprouts. They are fine growers,

prolific bearers, and seem particularly suited to our soil and climate. I believe them to be a seedling that has not yet been described; have been unable to trace them back to their origin, but still hope to succeed in doing so. Some of the trees not over six feet high bloomed this spring. I have Lombard, Bradshaw, Spaulding, Shippers' Pride, Moore's Arctic and German Prune in quantity, with a few of many other varieties on trial. . . . I prune these trees somewhat after Hale's rule for pruning the peach—that is, by cutting back in March about half of last year's growth—but shall cut less as the trees get more age."

SAVED HIS TREES BY MULCHING.

A correspondent of *Popular Gardening* tells how he saved his plum crop in the summer of 1890: July and August were very dry, and I began to have fears that I would lose my plums from this cause, as the leaves began to droop and the plums to shrink. To counteract the effects of the drought, I covered the ground under the trees, so far as the branches extended, with coarse manure to the depth of six or eight inches, and then thoroughly soaked it with water. The watering was repeated after a few days, and I was agreeably surprised to see the trees revive, the plums swell out plump and nice, so that, as a result, I harvested a magnificent crop of choice plums which readily brought four dollars a bushel.

HOW TO PLANT A PLUM ORCHARD.

There is a tendency toward too close planting and sometimes this is carried to extremes. I have seen several plum orchards planted 10x10 feet that, even now, when only five years old, have much the appearance of thickets. Cultivation is impossible, the fruit is small and difficult to get at, insects find a safe harbor, and the whole arrangement is unsatisfactory and unprofitable. The condition grows worse with each year. In most cases the suggested remedy, removing alternate trees, will not be followed until too late, if at all, and within a very few years the whole must of necessity be destroyed and the labor of planting lost. The most common practice is to plant 15x15 feet, but this is too close for fully developed trees of spreading habit. A better plan is to plant 15x20 feet, or to adopt the accepted California practice and allow 20x20 feet.

There seems to be a decided preference for low-headed trees, on the ground that they are less subject to injury from winds, and that less trunk is exposed to the action of the sun. With low-headed trees the disadvantages of close planting are more quickly apparent. The best formed trees are those headed at from thirty to thirty-six inches from the ground, and this is the distance preferred. Young trees are frequently injured by what are known as frost cracks, a longitudinal splitting of bark and wood on the south side of the trunk, occurring in late winter or early spring, and attributable to the extreme daily range of temperature, which often occurs at this season. To guard against this injury, the trunk should be protected in some way.

Various devices have been used, but we have found wrapping with burlap the most effective and least expensive. Burlap that had been used for baling was purchased at dry-goods stores for two cents a pound, and cut into four-inch strips, three and four feet long, one pound giving, as an average, nine strips. These are wound spirally on the trunks, being held at the top by a lap and by tying with cord at the bottom. One man can cover from fifty to sixty trees an hour, with the material prepared and ready at hand. The covering is applied in November and removed in April or May. The same bands will serve two or three seasons. The whole cost is less than one cent a tree, and well repays the trouble. —C. S. C., in *Denver Field and Farm*.

A COMMERCIAL PLUM ORCHARD.

In planting a commercial plum orchard, location, varieties and management must be well considered. While the plum is not so sensitive to location as the peach, it will not bear the neglect which so frequently falls to the apple. A good elevation is desirable, but not absolutely essential to success, provided other conditions are favorable, such as a good soil and thorough drainage. There should be but few varieties in a commercial orchard, but those selected should combine size, quality, and a fine appearance. As a rule, blue and purple plums sell best, as the yellow varieties are frequently placed on the market before they are ripe.

A good general list will include the following: Of the dark kinds, Bradshaw, Duane, Purple, German Prune, Lombard, Englebert, Quackenboss; of the yellow sorts, Coe's Golden Drop, General Hand, Jefferson, Yellow Egg. There are many other excellent varieties, but the above is a good general list. Of the Japanese plums, Abundance, Burbank, Bailey, Satsuma and Willard have been highly recommended.

Thorough cultivation, early and frequent spraying, and the jarring sheet for curculio, are necessary to success. Before the leaves start, go over the orchard and carefully cut out and burn all black knot. This is imperative. The trees should receive what pruning they require before the buds start, and the first spraying should be just as the buds are opening. Corn and potatoes may be planted in young orchards, but when the trees come into bearing they should receive the full use of the land. Never sow wheat or oats among trees, as they are sure to rob the orchard of more than they return the owner.—*G. L. P., in American Agriculturist.*

RAISING PLUMS IN NEW YORK.

For years the culture of the plum in New York was largely confined to the region adjacent to the Hudson river. Indeed, commercially considered, the business may be said to have had its inception there, from which it has moved westward, and to-day has become one of the largest of the fruit-growing industries. The European sorts, comprising a few varieties only, are principally grown, and will be for years to come, while the advent of those of the Japan type has given a fresh impulse to the business that is likely to continue. The Abundance was first introduced, followed by the Burbank, which, by reason of its superior shipping qualities, great productiveness, and acknowledged value as a canning fruit, heads the list as a favorite orchard sort. Satsuma is gradually growing into favor, with sentiment divided as to productiveness and quality, while its color is against it as a market sort. Of more recent introduction, the Red June has shown itself to be wonderfully hardy in fruit-bud, very early in ripening, its fruit of good quality, and so attractive in color as to command the markets on which it is placed, while Wickson, October Purple and Hale complete the list of those seedlings of foreign parentage destined to work a revolution in American plum growing. The Wickson, while of excellent quality and great beauty, has up to the present time failed to show sufficient productiveness to entitle it to a place in the commercial orchard. The trees make a strong growth and, at this season of the year, as usual, are loaded with fruit-buds that give an enormous bloom but fail to set the fruit. It is possible that with increasing age this fault may be changed. To my own taste the Hale excels all others in quality, while the October Purple, maturing its fruit quite late and being so attractive in color, will without doubt supply the requirements and great demand for a late plum. It may be picked green, and in the course of ten days or two weeks will be found to color and mature perfectly for market.—*S. D. W., in American Agriculturist.*

ONE WHO DOES NOT FEAR THE CURCULIO.

Plums are a desirable attraction to any home. I can remember the plum trees which furnished such delectable fruit on the old farm homestead, where I was born fifty years ago. I remember to-day how those fat, yellow, juicy plums tasted to me as a boy. Remembering this, and remembering that children enjoy such fruits far more than older people, I have ever placed an abundance of fruit in their reach.

About twenty years ago plum culture was almost abandoned, owing to the depredations of the curculio, which stung the plums early in the season, and seriously injured the crop. Currant culture was also abandoned, owing to the currant worm, and potato culture was almost abandoned, owing to the potato bug, but later it was learned that these insects could easily be destroyed, and that, where large orchards of plum trees were grown, curculio was often a blessing in thinning out surplus fruit, since plum trees, more than any other fruit-trees, are liable to overbear; therefore, where plums are grown in orchards, often no attention is paid to curculio; indeed, the curculio is not dreaded by any one in these days who understands its habits. I grow the plum in my city yard, pay no attention to the curculio, and get an abundant crop. The plum comes into bearing at an early date, often two or three years after planting. The trees can be planted more closely together than the apple, pear or cherry, the branches not being so wide-spread. Do not fail to plant at least a few plum trees.—*G. W., in Green's Fruit Grower.*

THE BANNER PLUM ORCHARD IN MICHIGAN.

According to *Green's Fruit Grower*, Prof. W. J. Green thought the finest crops of plums ever grown in Michigan had been produced at Grand Rapids last year in an orchard of 1200 trees occupying four acres of ground. It was owned by a commercial traveler, and the man in charge had orders to cultivate after every rain and at other times when there was nothing else to do. The orchard was cultivated forty-two times. Plum rot was very bad last year, but only thirty-three per cent. dropped from sprayed trees, while eighty-four per cent. dropped from those not sprayed. Leaving every third tree unsprayed each year contaminated those sprayed, and the percentage of rot was greater than it would have been could all of the trees have been treated. He thought Abundance and Burbank plums would be a permanent addition to the fruit list, and probably some others of the Japan list; but it would be useless to plant any Japan variety in localities where early bloom was liable to be destroyed by the late frosts, all the species being early bloomers, some blooming two weeks earlier than native and European sorts. The foregoing forms an elegant tribute to the practices of thorough cultivation and thinning.

SATSUMA AS A PLUM STOCK.

The Marianna plum is very generally used as a stock for the plum. The stocks are grown in the South from the cuttings, as they root there very rapidly, and will not do so in the North. The seeds of the Myrobalan (which is a species of plum from Europe, and of which the Marianna is a variety) are also grown for plum stocks. I have lately heard that the Satsuma plum, which is one of the Japan varieties, makes a most excellent stock for the plum and peach, too. If this is true, and it will grow from cuttings, then we have a very valuable thing that we did not suppose we had. I do not see why the seedlings of any of the Japan plums might not be good for plum and, perhaps, peach stocks, too. The trouble would be to get the seeds out of the fruit without losing the pulp; for they are nearly all clings, except Ogon. Cherry stocks must be of two kinds.

The sour cherries should be budded on Mahaleb seedlings. The Hearts and other rank-growing kinds of the sweet class should be worked on Mazzard stocks. This is necessary because of the diverse natures of the two classes. The stock and scion or bud must be reasonably congenial if the best results are to follow.—*Professor Van Deman, in Rural New Yorker.*

ANOTHER PROFITABLE PLUM ORCHARD.

While living in the village I planted some seventy-five plum trees on a portion of my lot, built a fence around them and kept hens among the trees. Most of the trees were Lombards, and by close pruning and thinning of the fruit I got very good results. Many of the trees commenced to bear the second season after planting. I remember one tree in particular that gave me a half bushel of beautiful plums the next season after it was set out. It was a Geuii, but it nearly killed the tree. Another tree (a Lombard) produced four bushels of plums. At four years old I got four dollars a bushel for my plums, so it will be seen that there was money in plums. The last season I lived on the place I got about seventy-five bushels of plums from the seventy-five trees and several of the trees were not old enough to bear. The next season it was estimated that there was 100 bushels, and now after six years the orchard, owing to neglect of its present owner, is well covered with black knot, and worthless. This orchard, if properly cared for, would have given an annual income of at least ten per cent. on the money paid me for the place, and three days' work each year, aside from picking, would have been all the time required to have kept the trees in first-class shape.

On my present place I have 200 plum trees that have been bearing one to six years, and this spring [1900] I will set out 300 more trees.—*A. A. H., in Green's Fruit Grower.*

HAS ABSOLUTE FAITH IN JAPAN VARIETIES.

A large number of my plum trees are of the Japan varieties, such as Abundance, Burbank, and a few each of Wickson, Red June, Hale, Chabot, and Satsuma (the latter is worthless here), and my this spring's order will call for Lombard, Red June, Wickson, Abundance, and Chabot (Yellow Japan). This will give me an orchard of 500 plum trees, which, of course, is not a large one, as compared with some of the large commercial orchards of the country, but if rightly cared for should give quite a lot of plums after three or four years.

I have great faith in the varieties of Japans named in this list, and would not hesitate to plant large orchards of them. I also have great expectations for the newer varieties of Mr. Burbank's creations, samples of which he sent me last season. Climax is especially fine; also America, Chalco, and Apple. I also have Giant Prune top-grafted, which produced beautiful fruit the second year from the graft.

Of the older varieties of plums Lombard stands at the head of the list here. We already have quite a large per cent. of this variety, and shall plant 100 more this spring. When we first commenced planting trees on this place we put red raspberries in between the rows of trees on a part of the lot, but I would not do it again, or advise any one else to do so. Trees planted the next spring with no raspberries among them are certainly twice as large, and have given me ten times more fruit than those where there were berry bushes.

We ran the cultivator in them as long as we could, and have manured the land well, yet the bushes seem to get the best of it. We will root out the raspberries after this season and give the land up to the trees and hens. I believe it is better to get one good crop of fruit from the land than two poor ones, although we should not complain much, for we have got each year a fine crop of berries that have brought good prices.

GROWING PLUMS IN KANSAS.

EXPERIENCE, CONCLUSIONS AND ADVICE FROM SIXTY-FOUR KANSAS
FRUIT-GROWERS.

H. M. Rice, MUSCOTAH, Atchison county. I have fifteen plum trees in bearing which have been planted four years; they are Wild Goose, Pottawatomie, and Blue Damson. Of these, the best bearer is Wild Goose. I have tried most of the Japanese varieties and found them worthless. My soil is a sandy loam, sloping to the south. Plant fifteen feet apart. Usually receive \$1.50 [per bushel] for the fruit. Have never grown, budded or grafted my own trees. If planting all over again, I would set out the Wild Goose. Would plant in the chicken yard. My neighbors do not grow plums. Do not consider them a good paying crop in this locality.

W. H. Tucker, EFFINGHAM, Atchison county. I have thirty plum trees in bearing which have been planted from eight to fifteen years. There are fifteen Wild Goose, six wild Kansas, five Abundance, and four of Shippers' Favorite. The best bearer is the wild variety. My land is a high prairie composed of black, sandy loam. Have never grown, budded or grafted my own trees. My neighbors grow but few plums.

C. A. Blackmore, SHARON, Barber county. This is my seventh year in Barber county. I have a plum orchard of about 400 trees; I have several varieties of the Chickasaw type that bear heavily every year, and are of good size and quality. Wild Goose is of but little value; it bears but little, and is subject to leaf rust and other diseases; I would not plant it. Forest Rose is a good plum; tree hardy and a good bearer. Marianna is worthless. Damson, Shropshire, Green Gage and German prune do well. German sometimes fall off on account of curculio. Of the Japanese varieties, the Red June bore a heavy crop last year; not a plum fell off; they are the size and shape of guinea eggs; dark red in color; pit small. Wickson is a very rapid, upright grower; it bloomed heavily last year, but all blossoms fell off. Abundance is a very beautiful, upright tree, which promises to do well. Burbank is a rank, spreading grower, and promises well here. Hale is a rapid grower, too young with me to fruit. Gold is a hardy tree, and hung full of golden fruit last year; it blooms very early; think the frost will usually get it. *Prunus simonii*, Satsuma, Wolf, Shippers' Pride, Pond's Seedling, Kelsey and some others I have not yet fruited. Weaver does not bear at all. Ohio Beauty, a September plum, does well when the autumn is not dry. My soil is sandy and from three to ten feet to the water. Blooming time of different varieties [in Barber county]: Gold, Red June, and Satsuma, first blooms appear April 12; are in full bloom by the 15th, and have fallen by the 23d. Wickson and Burbank, first blooms appear April 12; in full bloom by the 16th, and have fallen by the 23d. Chickasaw, first blooms appear April 14; in full blossom by the 18th, and have fallen by the 27th. Poole's Pride, first blooms appear April 15; is in full blossom by the 18th, and have fallen by the 26th. Wild Goose, first blooms appear April 15; is in full blossom by the 20th, and have fallen by the 25th. Ohio Beauty, first blooms appear April 20; is in full bloom by the 27th, and have fallen by the 30th. German, first blooms appear April 22; is in full bloom by the 27th, and have fallen by the 30th. Damson, first blossoms appear April 22; full bloom by the 28th, and have fallen by the 30th.

A. S. Huff, ENON, Barber county. Plums are a success in this part of the state, especially the Wild Goose. I consider the plum a successful crop, one that we can always rely upon. My plum orchard has borne good crops for nine years, or ever since old enough to bear, and a crop I could not well get along without. Other varieties that I have are not as successful.

E. T. Daniels, KIOWA, Barber county. I have twenty plum trees in bearing, planted from five to twenty years; they are Wild Goose, Lombard, De Soto, Wolf, Lambert, Abundance, Burbank, and Satsuma. Of these I find the Wild Goose, Lombard, De Soto, Abundance and Burbank to be the best bearers. Those doing best are Abundance and Burbank. My Satsuma tree died; do n't think much of it; but the other two are No. 1. Will have Red June and Wickson in bearing next year. I plant twelve feet apart. I have grown, budded and grafted my own trees. If planting over, I would set out Abundance, Burbank, Wild Goose, De Soto, and a few Lombard, close to the house, so I could keep the birds out of them; otherwise they get most of the fruit.

J. R. Dunkin, SHARON, Barber county. Here in Barber county plums of all varieties, as a rule, do well unless they get frosted about blooming season; I do not remember their being killed while dormant. Of the Americans, I prefer Lombard, Forest Rose, Chickasaw, Wild Goose, and Wolf. The Marianna is a poor plum here. Of Japan varieties, Abundance, Burbank, Kelsey, *Prunus simonii*, Wickson, Hale, Chabot, Red June and Willard do well here; there are many others not yet tested sufficiently, but I think this the land of and for the plum. Plums are in good demand, and sell readily at fifty cents to one dollar per bushel. It surely must pay to plant the plum liberally here in Barber county. I would recommend planting more of them.

C. L. Gunn, HEIZER, Barton county. I have twenty plum trees in bearing, planted from ten to fifteen years. They are the Wild Goose and three varieties that I do not know the names of. One is a very large, purple plum; the other two resemble the Wild Goose somewhat. They are all good bearers, excepting the purple one, which blooms so early it generally gets caught by frost. They are planted among apple trees, on a level, sandy creek bottom. I generally get from seventy-five cents to one dollar per bushel. Have never grown, budded or grafted my own trees. The hardy varieties pay reasonably well here.

George Ettridge, ROBERTS, Barton county. I have eighteen plum trees: Ten Pottawatomie, two Wild Goose, six I don't know the names of. I have a lot of wild plums I got off the Smoky river; some are as good as Wild Goose. Those that are bearing are the two Wild Goose, and one other I do n't know the name of. It is no good, no matter what the name is. The Wild Goose does very well here. I set out, cultivate and care for them the same as for cherries. Plant in rows, ten feet apart each way. Do not prune much. My Pottawatomie had a few plums on last season, at two years old; I think they are too small. The only thing that seems to bother my plums, both wild and tame, is the curculio. Some years they are bad; other years they do not bother. I never spray.

L. C. Clark, HIAWATHA, BROWN county. In the planting of a plum orchard several important facts should be kept in view. (1) Plant thickly or close together, not farther than twelve to fourteen feet apart, and mix varieties in, planting a row of one kind and then a row of some other kind; there are many varieties of plums that but imperfectly fertilize their own flowers; hence the necessity of other kinds in the vicinity. (2) Plant enough trees to make it worth while to cultivate and give them attention, and furnish enough fruit for the

curculio and the family also. We see isolated trees nearly always bare of plums, partly for lack of fertilization, and because there are about so many insects on a given area of earth, and if you have a few trees they will concentrate on these few, and the crop is entirely destroyed. While if twenty to fifty trees had been planted the curculio does an equal or greater amount of destruction, but there are plenty of plums left for family use or market. This same rule works with cherries and the birds: one or two trees, birds get the majority; a long row, birds get about the same number, but there are plenty left for market. We plant plums twelve feet each way, but this can be changed to ten by fourteen feet, and give a wider space one way for cultivation. In an orchard of 275 trees we planted the following varieties, which ripen nearly in the order named: Ten Earliest of All, 10 American Eagle, 10 Poole's Pride, 31 Red June, 16 Abundance, 16 Burbank, 16 Wild Goose, 17 Moore's Arctic, 34 Gold, 35 Wickson, 20 Orient, 6 Clingstone Damson, 10 Freestone Damson, 10 Grand Duke, 10 Monarch, 7 Coe's Golden Drop. We planted in the fall and mulched with stable litter, to prevent severe freezing of roots; to favor the formation of callouses on cut and bruised roots, scatter the litter in the spring. Plant from three to four inches deeper than the tree stood in the nursery, and cultivate shallow, not over two or three inches—probably less would be better. After the orchard is four to six years old seed it down to clover and pasture with hogs, or make a chicken-yard of it. In the absence of hogs or chickens, pick up all fallen fruit and destroy it, as here is the breeding-place of many insects that injure the plum. Head plum trees low, and they need very little pruning; as far as practical, in pruning favor the growth of a leading stem, and let all other branches be secondary. If two branches grow out equally, forming a fork, cut one back severely and encourage the growth of the other by leaving growth full length; this will prevent crotches, which split down when heavily loaded with plums. Most varieties can be shaken upon sheets in gathering for home market, thus getting the ripest fruit, but for shipping to a distant market they should be carefully picked by hand.

J. H. Moyer, HIAWATHA, Brown county. The first plums that I planted here on my farm were the Chickasaw. They were sent to me by my father from northern Illinois. They were sprouts from the roots of old trees and did not bear where I planted them. I think that the curculio was the cause of them not bearing, and having read that plums ought to be planted close to the hen-house so that the chickens could get at the curculio and destroy them, which they certainly would do, I took up my trees and planted them in the chicken-yard, but did not succeed much better; still I had one or two good crops, but I would not plant any more Chickasaws if the trees were given to me. It is the poorest plum for eating and canning I have ever raised. Next I planted the De Soto; these we grafted (spliced) on Chickasaw roots. These came in bearing in three years from grafting. The De Soto was a good plum and was well liked by all of my customers. The only fault with this plum is that they bear too full; the trees could not hold up under the load of fruit, and when so full the plums are small. For this plum I found ready sale in the orchard at \$1 per bushel. At the time of grafting the De Soto, we also grafted a large purple and a green plum. The names of these I did not get. The purple plum bore several crops, and I found ready sale for them at three dollars per bushel. This was a better plum than some of the California plums sold in our towns here. The green plum is also a very fine plum, but rots badly on the trees when nearly ripe.

On the 20th of September, 1894, when these trees were eleven years old, we had a severe hail-storm, which caused nearly all of them to die. I had, however, planted in the spring of 1893, 200 so-called Pottawatomie plums. They were

badly mixed, being no less than four different kinds, with two or three wild ones among them. There were a number of a variety that looks and grows so near like the Wild Goose that almost any one would say it was the same; but not so. A few Wild Goose mixed in ripen nearly a week earlier than this other kind. This is a better plum than the Wild Goose, is more round, good size, and fine looking. It generally brings twenty-five cents a bushel more than the Pottawatomie. I was told by a fruit man that they were the Moore's Arctic; another tree salesman called them Charles Downing. It is a good bearer and fine seller. In this lot of trees I also found several which reminded me of a picture I used to see in my boyhood days, where the artist tried to show us what the tree with the forbidden fruit looked like; the foliage looks as green as any I ever saw, and the plums are as red and glossy as paint or varnish could make them, and this a month before they are ripe. The plums look very tempting when red and still as sour as a wild crab. I at first thought them worthless. Some of my customers thought I should have a name for each, and rather insisted on it; so I named it "Devil's Choice." Not a very nice name, is it? But I think you will understand why I gave it that name. It is rather dry and mealy-like, a very dark red, drops easily when ripe, and will lie under the trees and wilt, but seldom rots, while the others named will not keep long after ripening. The Pottawatomie is an enormous bearer, and on that account rather small. It is very thin-skinned and very sweet; would be a poor shipper on account of thin skin, and its sweetness attracts the bees—they like to work on them. They are so full of juice it often runs out of the boxes that I haul them around in.

After the hail-storm I spoke of I had to cut fully ninety per cent. of the tops off of my young trees. Only a very few limbs were left on them. I have done no trimming since; I am not satisfied, in my mind, that it would pay. I believe it would increase the size of the plums some, but I doubt very much whether it would increase the number of bushels sufficiently to pay me, as I am always too busy, and I would not hire it done unless I knew that I had a hand who thoroughly understood his business. While my trees were small and not in bearing I planted potatoes between them; as soon as they began to bear, I made a pig-tight fence around the orchard and turned my spring pigs in after they were old enough to wean. As soon as the plums began to ripen I turned the pigs out and commenced to pick the fruit, always shaking the trees lightly, so as to get just the ripe plums each day. The bad plums were carefully picked up each day and carried to the hogs as the good plums were gathered. I have quit turning the pigs in the orchard, as some of the trees are so low that the limbs often touch the ground; but when my plums begin to ripen, I go through the orchard and pick up all the plums, even down to the dry pits, and feed them to the hogs, and always, after that, when we gather the plums, each picker has two vessels, one for the good and one for the bad plums. In this way I know that many of the insects are destroyed, and it makes it much nicer picking when the bad plums are cleaned out from under the trees. We never pick off the trees, but always shake them lightly before beginning to pick up. I don't spray any, and my plums, as a rule, are as free from marks of insects as any fruit I ever saw grow; and I firmly believe that the surest way to success in plum raising is: First, to plant your trees all in one place; second, plant a sufficient number of trees, so that the enemy of the plum within reach of your grove cannot destroy all of your fruit; third, when your trees begin to bear, look after the refuse plums just as carefully as the good, and you will succeed.

I have 400 trees—200 not yet in bearing; they are twelve feet apart in the rows, but if I would start another grove I would plant far enough apart so as to

drive through with a mowing-machine. I cannot cultivate my older trees any more. I have to mow the weeds with a scythe, and I always have a good crop of them. I mow but once in a season, when we want to commence to pick the plums. My opinion of the profitableness of plum raising is good. I had 130 bushels last year, which sold for \$1.25 per bushel; could have sold as many more if I had had them. Many people will not plant trees because they have planted a few and cannot raise any, and think to plant—say fifty trees—is too costly an investment with nothing in sight. And again, many of our “hogs-and-corn” Kansans would not be willing to humble themselves; get down on their knees and crawl around under the trees and pick the fruit off the ground, like we have to, but let them go to waste even after having raised them.

Geo. A. Wise, RESERVE, Brown county. I have twenty plum trees in bearing which have been planted five years; they are Wild Goose, Golden Beauty, and Miner; Wild Goose is the best bearer. My soil is black loam, on a high level. I plant from ten to fifteen feet apart, but think it too close. Have no regular system of gathering the fruit; have never sold any. They usually bring from one to three dollars per bushel. Have never grown, budded or grafted my own trees. If planting over, I would set out Wild Goose, and some other varieties, twenty feet apart each way, and set them deeply. My neighbors grow plums, but not extensively. I consider them a good paying crop in this locality.

J. B. Saxe, FORT SCOTT, Bourbon county. I have 100 plum trees in bearing, planted from eight to ten years; they are Wild Goose, Miner, Bradshaw, Weaver, etc. The best bearer is Wild Goose. Of the Japanese varieties I have tried Abundance. Those doing best for me are Wild Goose and Miner. My soil is clay, nearly level. I have grown, budded and grafted my own trees. If planting over, I would put out only a half-dozen Wild Goose for my own use. My neighbors grow plums, but not extensively. Do not consider them a good paying crop in this locality.

S. F. Garrison, EL DORADO, Butler county. I have twenty plum trees in bearing, planted twelve and fourteen years. They are Wild Goose, Seedling Goose, Miner, several wild varieties, Wyandotte, Damson, and Marianna. The wild varieties are the best bearers. My soil is upland, sloping to the east. Plant the trees 10 x 15 feet. Gather the fruit from July to September; sell at El Dorado, receiving \$1.50 per bushel. If planting over, I would set out Wild Goose, Miner, and Damson. My neighbors are not growing plums. I do not consider them a good paying crop in this locality. The insects are very troublesome.

Dick May, ELK, Chase county. I have Wild Goose and Sand-hill plum trees, eight years planted; the Sand-hill is the best bearer in this locality. My soil is sandy bottom, sloping to the east. Plant eight feet apart; use the fruit at home. I have tried several wild varieties, and found them excellent. Have never grown, budded or grafted my own trees. If planting over, I would put out the varieties I am now growing. My neighbors grow plums. I consider it a good paying fruit in this locality.

Jere. Ellexson, CHAUTAUQUA, Chautauqua county. I have twenty-five plum trees in bearing, planted from fifteen to twenty years; they are Wild Goose, Washington, and Chickasaw. The best bearer is the Wild Goose, but the Washington is a close second. Washington is best for market. My soil is sandy, with clay subsoil, sloping to the south; plant 16½ feet apart, and gather the fruit when it begins to turn red. Sell in the orchard, at one dollar per bushel. Have tried one wild variety, and found it worthless. Have never grown, budded or grafted

my own trees. If planting over, I would put out the varieties I now have, and some other good ones. My neighbors grow very limited quantities of plums. Do not consider them a good paying crop in this locality.

S. H. Domony, AURORA, Cloud county. Have no plum trees in bearing. My soil is limestone. Would plant twelve feet apart, in blocks. Have tried some wild plums, but find them no good for bearing. Have never grown, budded or grafted my own trees. If I were planting, I would put out Abundance, Burbank, Red June, and Wickson. My neighbors grow a few plums. I consider them a good paying crop in this locality.

Mrs. E. O. Beavers, OTTUMWA, Coffey county. Have twelve plum trees in bearing; they are mostly Wild Goose. Have tried other varieties; they were not a success. I find Wild Goose to be the best bearer. My soil is a black loam, sloping to the south. Plant twenty feet apart. Market the fruit in baskets; sell at home, receiving from fifty cents to one dollar. Have never grown, budded or grafted my own trees. I did not plant for market, but find ready sale for surplus. I would consider them a fairly good paying crop in this locality. Neighbors grow a few.

J. H. Bilsing, UDALL, Cowley county. I have forty plum trees in bearing, planted five years. I have not heretofore grown many plums, as I feared the curculio, but as the Japs. were said to be curculio proof, I have tried them. I planted Burbank, Botan, Ogan, Satsuma, Chabot, Wickson, and Kelsey. The first year they came into bearing the curculio did not attack them but little, and I thought "now I am all right and can grow plums," but, alas for bright prospects and pleasant anticipations, I find the Japs. succumb as well as all others. During the past two seasons I jarred the trees, but in spite of that they got in their work, and a large per cent. were worthless. I have picked up the fallen fruit above the size of cherries once or twice per week. The Burbank, I find, rots badly on the tree, caused, I presume, by the worm inside, but when the rot starts, it takes the entire cluster. I find the best bearers are Burbank, Botan, Ogan, Chabot, and Satsuma. My soil is loam, intermixed with sand, and is level. Planted my trees twelve feet apart. I have tried one wild variety, and found it excellent. Have never grown, budded or grafted my own trees. If planting over, I would set out the varieties I am now growing, and also Moore's Arctic and Blue Damson. Neighbors are growing only a few plums. I think they would pay if we could rout the curculio.

J. H. Sayles, NORCATUR, Decatur county. I have twelve plum trees in bearing which were planted in 1890; all are dying. I am discouraged with plums. Of the Japanese varieties, I have tried Abundance, Botan, *Prunus simonii*, and a few others; leaf-rollers destroy the leaves every year. My soil is prairie land sloping to the northeast. Planted my trees 16 x 20 feet. Have tried some wild varieties and found them excellent. Have never grown, budded or grafted my own trees. I am a novice with plums. My neighbors do not grow plums, and I do not consider them a good paying crop in this locality.

P. Wagner, DRESDEN, Decatur county. I have 200 wild plum trees, planted this year. [This shows faith.]

James Dunlap, DETROIT, Dickinson county. I have about thirty plum trees in bearing which have been planted ten years; they are very similar to the Wild Goose, but later; got the sprouts from a neighbor who called them Peach plum, but do not know where he obtained them. I also have a grove of the common wild creek plum, all of which do well. My soil is a black loam sloping

toward the east. I plant twelve feet apart. Usually get one dollar per bushel; last year buyers gathered them themselves. I have never grown, grafted or budded my own trees. If I had it to do all over again, I would plant the same as I have now and the Wild Goose and Marianna. My neighbors do not grow plums. I consider them a good paying crop in this locality.

A. H. Griesa, LAWRENCE, Douglas county. The plum for the whole Mississippi Valley is one of the minor fruits of commerce, but comparatively few kinds are successfully grown there, while in most of Europe it is of large importance; besides for home consumption, it is largely grown for export and drying. The varieties there are the *domestica* or European type. Most all the kinds there grown are the same as have been for many years. In the eastern and northern parts of the United States it is grown to a considerable extent. But the greatest success lies to the west of us. West of a line drawn north and south near Hutchinson, Kan., you may begin the planting of any of the *domestica* class with reasonable hope of success; as you proceed to the higher and dry regions of the valley success is sure every year. I have never seen better plums grow in any place than in Garden City, Kan. They are comparatively near the markets and have the climate to dry them the same as in Arizona and California. This may lead some one to ask, Why can they be grown there and not east? The trees grow in both sections, blossom, and set fruit, but in the east it rots, caused by a fungus disease that seems to develop best in the hot and moist climate of the Mississippi valley, and does not develop at all in the higher and dryer regions of the western half of this state and the country beyond, nor in the high lands of Texas, where plums are now largely grown.

The trees are hardy and well adapted to most any part of the country; they will blossom and set fruit, but during the hot, moist days of the summer, before they ripen, this fungus destroys them. Most of the European kinds are not suited to this great valley; only the Damson and Lombard seem to be fairly reliable. Here our main reliance should be on the American and Japan kinds. The best varieties of these classes are often grown anywhere in a small way to a good profit. The American kinds are the most hardy in tree for this region. Of these, the Wild Goose is the standard, and, with the Pottawatomie, Stoddard, Whittaker, and many others, are the more largely grown. These kinds are not regular bearers; the seasons, insects and other causes prevent or make the crop. The trees are not often planted for orchards, but are more generally grown in the yard, fence corners, or chicken lots, and the product is as so much gain for the family use, or market, if in surplus. No fruit will retain the natural flavor better than the plum when canned; its richest qualities are then brought forth; for this reason it is advisable that every man with room enough should plant at least one plum tree as a duty to his family. The trees are very productive, with a great limit in season of ripening. Before this nation began the expansion policy the horticulturists began to expand, and brought new types of fruit from the ends of the earth, as from Russia, China, Japan, Persia, and other countries. Apropos to this, we had great things in plums from Japan, China, and Turkey; not that the kinds from there seemed adapted to our wants alone, but those kinds seemed especially good as a parent, with our more hardy native sorts, to produce a race of cross-breeds or hybrids that promise more than we as yet have recognized possible.

The *Prunus simonii*, from Turkey and Persia, is of no value to the Mississippi valley, but is one of the parents of several promising kinds. So many of the pure Japans, with unspeakable names, have [caused] more new crosses or hybrids than all those imported, not one-fourth of which are yet known among

fruit-growers. Among them are the best improved kinds for dried prunes from the Pacific; so much better than the old foreign kinds; a result of crossing. The Abundance and Burbank are the best known of that large and new class; their large size, great productiveness, bright color and good quality make them a favorite with the public.

A few words as to culture. They can be planted closely in the back yard, where the soil is packed firmly, and in places where the poultry have free range to destroy the insects. The trees can be jarred after the blossoms fall, to let the insects, the curculio, drop on a sheet, which should be previously spread under the tree; then they can be destroyed. In doing this you not only destroy them, but their [prospective] increase, and if persevered in you will capture all in a few efforts. This applies more to how they are grown than how they ought to be. Where they are grown extensively they should receive good culture and correct care. These lines are not to instruct such cultivators, as they are able to give us pointers on that topic. But plums can be grown, of the best American and Japan kinds and their hybrids, in a paying way in all this Mississippi valley. In favored localities some of the European kinds do well. Every one with even a small lot can have a few trees of select kinds and enjoy the blessings of this choice fruit, with many chances for yet better kinds in the future. As a help to determine the classes, I will give a list of the more prominent kinds of each, beginning with the oldest in our cultivation.

Domesticas.—Lombard (cling and free), Damson, Red and Yellow Gage, Red and Yellow Egg, Quakenboss, General Hand, Washington, Coe's Golden Drop, Fellenburg, Niagara, Moore's Arctic, German or French Prunes. These are the leading kinds grown East and West.

Americans.—Wild Goose, Miner, Pottawatomie, Newman, Caddo Chief, Stoddard, Whitaker, Hawkeye, and Forest Garden. These are familiar kinds in cultivation in the Mississippi valley.

Japans.—Abundance, Burbank, Kelsey, Satsuma, Botan, Red June, Red Negate, Chabot, and Norman. These are the best known Japans.

Hybrids.—Wickson, Climax, Gold, Gonzales, America, Apple, Bartlett, Chalco, Juicy, Ruby and Shiro are some of this interesting class.

This divides them into but four groups, which is enough for our consideration. The hybrids are mostly from Luther Burbank, of California, but there are also some from Texas, North Carolina, Maryland, and other states; so the possibility of growing acclimated kinds here is within our reach and privilege. Hybridizing is largely done by natural process; when trees of two races are planted near each other, nature, by insects or wind, carries the pollen from one to the other, and from the resultant seed is possible the new kind you are looking for, to make plum culture in this valley, and elsewhere, a success. Of course there is a way of transferring the pollen by hand, but it requires patience, skill, and perseverance, while in the former way it is done just as well and effectually.

J. W. Somer, WILSON, Ellsworth county. I have several plum trees in bearing, planted five years. The varieties are Wild Goose and Marianna. The Wild Goose is the best bearer. My soil is a loamy clay, with a northwest aspect. I plant eight feet apart. If I were doing it all over again, I would plant the two varieties mentioned above, and would plant the Wild Goose in clusters. Plums have not received much attention in this county, but I believe, if they did, they would be a paying crop.

William Cutter, JUNCTION CITY, Geary county. There is no fruit-tree that is so universally neglected as the plum, and the fact that poultry will de-

stroy so many of the worst insect enemies of the plum is one of the principal causes of this neglect. For, in order to avail themselves of their valuable assistance, nine-tenths of the farmers and fruit-growers plant their plums in the back yard, in zig-zag rows, and the *now* recommended clumps and clusters, as near as possible to the chicken-house and other buildings, so that to cultivate with a horse is seldom attempted, and the hoe and scythe are about the only tools that can be used in their cultivation, and in a very few years the sprouts take full possession and defy the use of even the hoe and scythe, and the promising young orchard becomes one of the familiar plum thickets seen upon nearly every farm. These trees soon become so thick that they bear little fruit and that only upon the very tops of the trees, and in unfavorable years they bear nothing. The only way to prevent this sprouting is to plant trees budded upon peach, apricot or Marianna stocks, and then, if you plant them deeper than where the bud was inserted, you will have the sprouts about the same as if they had been grown from sprouts themselves. I believe that frequent cultivation will produce better crops than chickens; but, where possible, by all means use both. My most successful trees are in an enclosed chicken yard, and they are budded upon the peach. The most suitable soil, from my experience and observations, I would say is a sandy soil for our native or American varieties, with a clay subsoil for our old European sorts, and if there is any soil suitable for the Japanese and their offspring in *this latitude* I have never seen it tried. Of varieties, the natives are the most profitable, and the De Soto we desire above all others. The Pottawatomie is the best bearer, but too small. The Wild Goose and Robinson are all reliable and good. The Lombard is as reliable as any of the European sorts, excepting the Damson, and that is so easily affected by a dry spell that it is often a failure.

J. P. Emery, CIMARRON, Gray county. I have fifteen plum trees in bearing; been planted four years; they are Wild Goose, Lombard, and Damson. Wild Goose has been the best bearer; the others are just coming into bearing this year. My soil is a black loam, sloping to the south; I plant fifteen feet apart. Have never grown, budded or grafted my own trees. If planting over again, would put out the varieties I am now growing. My neighbors grow plums; I think them a good paying crop in this locality.

D. D. White, ENON, Harper county. I have ten plum trees in bearing, which have been planted twelve years; they are Wild Goose and Chickasaw; of these, Wild Goose is the best bearer. My soil is level, sandy loam. Gather the fruit when ripe. Use most of it at home, but what little I have sold I received fifty cents a bushel for. Have never grown, budded or grafted my own trees. My neighbors grow plums; they [wild] are too plentiful to pay in this locality.

John Bailey, HARPER, Harper county. I have 100 plum trees in bearing planted six years; they are Wild Goose and Miner; one is as good a bearer as the other. Have never tried Japanese varieties. My soil is a level, black, sandy loam. Have planted some ten feet and some twenty-five feet apart. Market the fruit in bulk in Harper. They bring from 50 cents to \$2.25 per bushel. Have never tried any wild varieties. I consider it a good paying crop my neighbors are growing several varieties.

F. W. Dixon, HOLTON, Jackson county. We have 500 plum trees, and can say from experience that they are the poorest paying fruit crop we have. In ten years we have not had a full crop on any but the Abundance. Wild Goose is very uncertain; even if a good crop of plums set, a heavy wind-storm before ripening puts your plums all on the ground. Miner seems to be a shy bearer, but an excellent tree, and fruit is prime for butters, etc. De Soto is the best

bearer of any native sort, but the tree is a poor grower, but it is probable our soil is not adapted to it. Marianna sometimes bears a full crop of small, poor-flavored plums; it is a rampant grower, but short lived, and is troubled with borers. Weaver is a very good plum, but shy bearer. Saratoga fruits for first time this year, and promises well at this time; we have several others, but as they are so unprofitable we take no pains to keep up with their names. Of the Japan varieties, Abundance has paid us; fruit large, but must be picked before it colors, as it rots badly; is ripe when a faint blush appears on it, and is far superior to any native plum for canning, preserving, etc. Burbank rots much worse than Abundance, and the fruit is of poor flavor. Plum trees generally were much damaged by the cold of February, 1899, and we think most trees will soon die.

F. L. Osborne, SOLDIER, Jackson county. I have eight plum trees in bearing, planted five years ago. They are Wild Goose and Marianna; the latter bears best for me. My soil is a black loam with a northern slope. Plant trees fifteen feet apart. Have never grown, budded or grafted my own trees. My neighbors grow plums on a small scale.

J. W. Williams, HOLTON, Jackson county. I have five plum trees in bearing, planted from two to ten years, four of which are Blue Damson, and one Japanese planted two years ago. It has plums on this year and they are fine. The Blue Damson does best for me. My soil is upland prairie, underlaid with hardpan, sloping towards the southwest. I plant from twenty-five to thirty feet apart. Never sell in the market. Have tried several wild varieties; only one ever fruited, but it sprouted so badly I dug them all up. Have never grafted or budded my own trees. Some of my neighbors grow plums successfully.

H. S. Cutter, SOUTH CEDAR, Jackson county. In the spring of 1889 I set out sixty plum trees of the following varieties: Thirty-five Wild Goose, ten Pottawatomie, five Lombard, five *Prunus simonii*. The ground was plowed in the fall of 1888, and the trees set in the spring of 1889, sixteen feet apart each way. Holes were dug for the trees just large enough and deep enough to set them in about the same depth they had grown in the nursery. The trees were "plum on plum," as the nurseries style it, and I find them more durable than those grafted on peach roots, as they are not so liable to be broken off by the wind. The plum on peach grows so vigorously that they are very brittle, and in a high wind are apt to break off just above the ground. I lost about one-half of one plum orchard in that way, while of those grafted on plum roots not one was blown off. The first crop of fruit gathered from the plum orchard set in 1889 was in 1894. The trees were white with bloom in the spring of 1893, but they did not set any fruit until 1894, when a fair crop was gathered from the Wild Goose, Lombard, and Pottawatomie. These three varieties have born crops of fruit every year since. During the year 1897 they yielded the finest lot of fruit I ever beheld. From two of the finest Wild Goose trees we picked twelve bushels of fine fruit. The fruit was picked and sold in the common half bushel baskets. The first picking brought one dollar per basket, later seventy-five cents, and the last sixty-five cents a basket. Of the above three varieties, the Wild Goose stands first in productiveness and market value, Lombard second, and Pottawatomie third. Of the other varieties, the *Prunus simonii* never bore a plum, and the trees are now all dead. Kelsey's Japan has born a very few plums, and the trees are nearly all dead. I intend to set out several plum trees this spring, and they will be "plum on plum"—Wild Goose, Lombard, and Damson. I have seen the Blue Damson bearing heavy crops of choice fruit in this county, and I will try what they will do for me. I never sprayed the trees,

and have not had wormy fruit. The poultry-house and yard was near the orchard, and that may be the reason why the fruit was free from worms.

E. M. Gray, PERRY, Jefferson county. In 1890 I planted an orchard of 300 plum trees, consisting of Wild Goose, Burbank, Abundance, Wickson, Red June, Weaver, Green Gage, and Blue Damson. The three first named did best for me on high, dry or well drained upland. I got no plums unless by clean cultivation. I found when I did not keep the ground clean of weeds or grass, my plums, just before ripening, rotted on the trees. I spray with Paris green and lime. I sell in berry crates at \$1.50 per crate for choice, and \$1 per crate for No. 2.

E. P. Diehl, OLATHE, Johnson county. I have thirty plum trees in bearing, planted from ten to thirty years. The varieties are Washington, Damson, Blue Gage, Wild Goose, Miner, and Chickasaw. Of these, the best bearers are Wild Goose, Miner, and Chickasaw. My soil is a black loam, sloping towards the north. Plant my trees sixteen feet apart, gather when ripe, and market in one-third-bushel baskets; sell in Olathe. They usually bring from sixty cents to one dollar per bushel. The Chickasaw is the only wild variety I have tried. I have grown, budded and grafted my own trees. If I were beginning again, I would plant Wild Goose, Miner, Damson, and Chickasaw. My neighbors grow very few plums. I consider them a good paying crop in this locality.

J. C. Beckley, SPRING HILL, Johnson county. I have fifteen plum trees in bearing, which have been planted from eight to ten years. They are Wild Goose, Weaver, and German Prune. The Weaver and German Prune are the best bearers. Of the Japanese varieties I have tried Abundance, which does very well, but is a little tender. It froze during the winter of 1898-'99. My soil is dark mulatto, sloping to the west. I plant two-year-old trees, fourteen feet apart. Gather in [grape?] baskets; sell at Spring Hill, receiving twenty-five cents per basket for them. I have tried several wild varieties and found them excellent, and do not know but that they are as good as domesticated varieties. Have grown, budded and grafted my own trees. If planting over, I would set out Wild Goose, Weaver, Miner, Lombard and Damson sixteen feet apart in an orchard, giving good cultivation for four or five years; then keep clean surface under the trees to prevent insects from harboring there. Would treat about the same as cherry trees. My neighbors grow a few plums. I consider them a good paying crop in this locality.

J. C. Beckley, SPRING HILL, Johnson county. This desirable fruit has not been as extensively planted in the state as it ought to have been, because of the damaging attacks of both the curculio and gouger (worms in the fruit), yet some facts have been gathered from the observations and experience of planters which encourage the hope that reasonable success may attend future efforts in their culture. Two classes have been used, viz.: Those of foreign origin and their offspring, and those of native origin, which differ much in character. The trees of the foreign class are not so hardy, productive or long-lived as our natives, and, while the fruit is vastly superior, their planting cannot be advised for extensive orchards. There are some of the native class which are quite successful, and of which it is quite safe to plant; the trees are hardy and produce crops of good fruit, which is less injured by the curculio and plum-gouger. Spring is undoubtedly the best time for planting, and those planters who live within reasonable distance of a reliable nursery had better obtain the trees in the spring, as there is too much loss in most cases, when procured in the autumn and heeled in, by mice, rabbits, dry freezing, and shriveling from becoming too dry during winter. The plum tree does best where planted closely; twelve to fifteen feet is usually

recommended; but my experience and observation teach me that they should be planted closer than that, say eight to ten feet. Why? Because we almost invariably find our native wild plums growing in clumps, in order that those weak in the fertilizing elements [pollen] will be benefited by the stronger [more potent] ones. I am satisfied that is the reason why some plum trees which are set too far apart bear little, if at all.

Elevation is not a very important point in the culture of the plum, only as it often furnishes the most desirable soil, which I think is more generally found in the bottom lands. The plum likes a northern slope best, for the reason that it loves damp, cool, moist, not wet, ground to grow in; the foreign class requires a rich, moist soil, underlaid with a stiff clay, and does better on upland; therefore they are short-lived, as are all plum trees planted on high prairie land. The native class thrives best on a sandy soil, which is largely found on bottom land, and such locations generally produce abundant crops. Good drainage is a very important factor in regard to the health of a plum tree. Where there is no natural windbreak one should be provided, as by nature it is almost invariably required. In all cases the plum does best when worked on its own roots, although they can be worked on the peach, but should be set deep to secure rooting from the scion or bud, as the case may be; in planting, the roots should be wet. Some foreign sorts that I budded on the peach are doing fine. I would not recommend mulching, as it makes a harbor for injurious insects. Close planting is preferable, as it keeps the ground shaded, and therefore cool and moist, beneficial both to the tree and to retard, to some extent at least, the development of insects. Cultivation should be shallow at all times, and none after they shade the ground thoroughly. Pick before fully ripe, and, as they ripen unevenly, the trees will have to be gone over several times. Pack in small baskets (I use small grape baskets), which are more suitable than boxes, and will not bruise the fruit as much; put only good, sound fruit in the baskets, and feed all that is wormy and faulty to the hogs. There has never been enough grown for the home market in Kansas yet. They should be handled about the same as cherries and peaches.

C. H. Longstreth, LAKIN, Kearny county. I have 200 plum trees in bearing, which have been planted ten years. The varieties are Wild Goose, Robinson, Pottawatomie, Forest Rose, Weaver, Miner, Coe's Golden Drop, Newman, Abundance, Burbank, Bailey, and a few others. Of these, the best bearers are Wild Goose and Robinson. Pottawatomie is nearly as good. Of the Japanese varieties, I have tried Abundance, Burbank, Bailey, Munson, and Satsuma. The Japanese varieties have not given me satisfaction so far; Wild Goose and Robinson are preferred to all others. My soil is a deep, sandy loam, nearly level. I plant one-year-old trees in early spring, twelve feet apart, mixing varieties all together, in order to pollinize well. Gather by hand, picking before too ripe, while still hard; market in one-third-bushel peach crates, packed solid and firm; sell a few at home, but in Denver as a rule, selling from 60 cents to \$1.25 per crate, netting us on the average, one dollar per bushel. Have tried a few wild varieties, but found only few good; most of them are worthless and unsatisfactory. Have grown, grafted and budded my own trees. If planting over, I would put out Wild Goose and Robinson for commercial purposes and no others, excepting a few Japanese and other varieties for experiment. My neighbors are growing plums. I consider them a good paying crop in this locality when properly grown and handled.

R. DeGarmo, OSWEGO, Labette county. The plum is one of the most valuable and perhaps one of the most salable of the stone fruits raised in this county, seldom failing to make a paying crop, although raised mostly for home consump-

tion, and not planted in commercial orchards. The most valuable of the kinds raised here are of the native variety, such as the Wild Goose, Miner, Weaver, and all of the Chickasaw varieties, while the foreign varieties that have been grown here do not seem adapted to this climate and soil, and have not so far paid for planting and cultivation. I will here give some of my own experience in raising plums, and then I will speak by the book. Some eight years ago I planted here, for family use, the following list of plum and apricot trees: Of Japanese varieties, the Abundance, Satsuma, Burbank, *Prunus simonii*, and Botan; of the native varieties, the Draper, Wild Goose, Wolf, and Blue Damson, and two varieties of the White Chickasaw. Now for the results: Of the Japanese, all are dead but the Abundance, which, in the eight years, have had one full crop, and they were badly injured last winter, two being killed outright—the others recovered, and are now full of buds in good condition. The plum we think the most of is the small White Chickasaw, which has so far never failed to bear a good crop since large enough to bear. This plum is rather small, yellowish-white, very sweet, with small pit, skin hard and solid, and troubled but little with the curculio. The Abundance is a fine, large plum, bears when young very freely; the skin is rather soft and much more liable to the attack of the curculio than the Wild Goose and Chickasaw.

Geo. Hildreth, ALTAMONT, Labette county. I have twenty plum trees in bearing, planted ten and twenty-five years. They are Wild Goose, Chickasaw, and common wild. Of these, the wild and Wild Goose are the best bearers. Have tried Japanese varieties, but found them unsuccessful. My soil is black limestone, sloping towards the west. I plant from twelve to twenty feet apart. Gather as soon as ripe and generally use the crop at home. I have tried several wild varieties and find them excellent for butter and canning. Have never grown, grafted or budded my own trees. If I were doing it all over again, I would plant the Wild Goose and some wild varieties. There are some other varieties that have done well for a while, but they perished soon. My neighbors grow some plums for home use and a few to sell. I consider them a good paying crop in this locality.

N. Sanford, OSWEGO, Labette county. I have ten plum trees in bearing, some planted less than a year and some fifteen years. They are Small Damson, Wild Goose, and Red Chickasaw. Small Damsons have been the most profitable and the best bearers, but are not likely to last over twelve to fifteen years. I am of the opinion the plums will not do on our black limestone soil, which is almost level. I market my fruit, which usually brings \$1.50 per bushel, at home. I have never tried wild varieties. Have never grown, budded or grafted my own trees. If I were planting over again, I would plant only the Small Damson. My neighbors do not grow plums successfully. I do not consider it a good paying crop in this locality.

D. E. Bradstreet, DIGHTON, Lane county. I have twelve plum trees. They are Marianna, Wild Goose, and Damson. The best bearer is the Marianna. My land is a dark loam bottom land, level. I plant three in a cluster, clusters seven feet apart [a new idea]. Gather the fruit when ripe. Have never grown, grafted or budded my own trees. If planting over, I would set the trees [clusters?] ten feet apart. My neighbors grow a few. I do not consider them a good paying crop in this locality.

Dr. J. Stayman, LEAVENWORTH, Leavenworth county. It is with some degree of reluctance that I offer a paper upon the plum and prune for your forthcoming pamphlet, not from want of experience, but that I have little to offer of

benefit to the public. Forty years ago I planted out twenty-five plum trees here, including Quackenboss, Blue Gage, Bavay, Green Gage, Bingham, McLaughlin, Lombard, Purple Egg, Richmond, Washington, and German Prune; a few years later I set out eighty-five more, including Purple Gage, Jefferson, Smith's Orleans, Imperial Gage, St. Lawrence, Green Gage, and Shropshire Damson. These have all proven unsatisfactory. My best success has been with the American species and varieties, and some of these have been failures; of about twenty-five varieties, the following have proven valuable: Miner, Quaker, Wild Goose, Godard, and Damson; I am now trying De Soto, Wolf, Wyant, Foster, Ross, and Klondike; these are all natives of Iowa or seedlings of such. The Forest Garden, of Iowa, is worthless here, and the Kickapoo, of Kansas, where it can be grown, is the largest and the best; perhaps no other native plum is so good, but it rots badly. Our only hope, in this climate, of growing varieties equal to the European, is by crossing the best American varieties with the Japanese. Seedlings from such crosses ought to succeed here.

W. M. Fleharty, LA CYGNE, Linn county. Have twenty-five plum trees in bearing, planted four years; they are Pottawatomie, Abundance, Wild Goose, and Burbank. The Pottawatomie and Abundance I find to be the bearers. My soil is black alluvial, sloping to the east. Plant trees twenty feet apart. Have never grown, budded or grafted my own trees. My neighbors grow plums, and I consider them a good paying crop in this locality.

D. C. Overly, HARTFORD, Lyon county. I have 1100 plum trees in bearing which have been planted four years; they are Gold, Red June, Lombard, Orient, Blue Damson, Abundance, Spaulding, Marianna, and Wild Goose. They were frozen three nights in succession this spring while in blossom. My soil is black loam, sloping to the east. Planted my trees twelve by eighteen feet. Have never grown, budded or grafted my own trees. My neighbors do not grow plums. I consider them a good paying crop in this locality.

James McNicol, LOST SPRINGS, Marion county. I have 100 plum trees, planted in 1886 and later. They are Wild Goose, Miner, Wolf, Lombard, German Prune, Marianna, Pottawatomie, Abundance, Burbank, Willard, and Satsuma. Of these, the Burbank, Abundance, Marianna, Pottawatomie and Wild Goose are best bearers. Of Japanese, those doing best for me are the Abundance. The Burbank is more prolific, but rots on the tree. My soil is a black clay loam, sloping to the north and west. I plant eighteen and twenty feet apart. Market in ten-pound baskets. Sell at home, receiving from thirty to forty cents per basket. I have tried several varieties of wild plums, but found none to be as good as Wild Goose or Abundance. If I were beginning over, would plant Abundance and Burbank. I consider them well worth planting and taking care of.

W. G. Stockard, BELOIT, Mitchell county. I have fifty plum trees in bearing, planted in 1881 and 1888. They are Wild Goose, Marianna, Imperial Gage, Burbank, Weaver, Ogon, Miner, and Sand plum. Those doing best for me are the Imperial Gage and Marianna. My soil is upland prairie, sloping to the north. Plant from sixteen to twenty feet. Sell the fruit in Beloit at one dollar per bushel. Have grown, budded and grafted my own trees. If planting again, would put out the Imperial Gage and Marianna. My neighbors grow plums, but I hardly consider them a paying crop in this locality.

J. T. Barnes, BELOIT, Mitchell county. I have 100 plum trees which have been planted from four to ten years. They are Wild Goose, Marianna, Pottawatomie, Robinson, Miner, Golden Beauty, Weaver, Wolf, Mito, Vanity, and two

unknown varieties. Of these, the best bearers are Wild Goose, Marianna, Pottawatomie, Robinson, Weaver, Mito, Vanity, and both of the unknown varieties. Of the Japanese varieties, I have tried Abundance, Burbank, Chabot, Kelsey, Red June, Willard, Wickson, Satsuma, Beekman, and Normand. Those doing best are Burbank, Abundance, Chabot, and Red June. The Kelseys were killed by the cold winter of 1898-'99; the Beekman, Normand and Wickson were frozen to the ground; the Satsuma never lives over one year. My soil is a sandy loam, river bottom, sloping towards the southeast. I plant my trees in rows from fifteen to twenty feet apart and fifteen feet in the row. Gather the fruit by hand a few days before fully ripe, and market at home; in Beloit they usually bring from \$1.50 to \$2.50 per bushel. Have tried one kind of wild plums; this spring I put out a few Sand plums sent me from the West; have grafted the Weaver plum. If I had it to do all over again, I would plant the Wild Goose, Pottawatomie, Marianna, the wild variety, and Abundance, Burbank, Chabot, and Red June, in rows twenty feet apart and trees from sixteen to twenty feet apart in the row. My neighbors grow but few plums.

P. C. Bowen, CHERRYVALE, Montgomery county. I have forty plum trees in bearing, planted from six to ten years; they are Wild Goose exclusively. Have tried several Japanese varieties, but they were a failure. Have also tried Blue Damson, Yellow Egg, and German Prune, which bore a few light crops and then died. Have discarded all except native varieties. My soil is a dark, sandy loam, sloping to the north and west. Planted my trees from eight to fifteen feet apart. Pick the fruit when partially ripe, in baskets, and sell by the peck, both at home and in Cherryvale, receiving about one dollar per bushel. I find Wild Goose is the only kind worth planting here. Have grown, budded and grafted my own trees. I use Marianna stock and graft scions in the winter, and plant in nursery rows in spring, cultivate, and set in orchard when one and two years old. Have used peach stock, but Marianna is best. Would always propagate my own plum trees for orchard setting. Some of my neighbors are growing plums. I consider native varieties a good paying crop.

J. C. Ross, HAVANA, Montgomery county. I have 400 plum trees in bearing, planted eight years; they are Miner and Wild Goose; the Miner is the best bearer. My soil is sandy, having a southern slope. Plant in the spring. Gather in July; market in peach baskets, in town. Receive from one to two dollars per bushel. Have never grown, budded or grafted my own trees. My neighbors grow plums. I consider them a paying crop.

John E. Sample, BEMAN, Morris county. I have thirty plum trees in bearing which have been planted ten years; they are Wild Goose and Marianna. The Wild Goose I find is the best bearer. My soil is black loam, sloping to the south. Planted my trees twenty feet apart. Use the fruit at home. I have tried several wild varieties, but find them to be no good. Have grown, budded and grafted my own trees. If I had to do it all over again, I would set out Wild Goose and German Prune; would graft all stone fruits on seedling apricots so the graft would be above ground; this would make them long-lived. Would graft in the winter and grow in nursery. My neighbors are growing a few plums. I do not consider them a good paying crop in this locality.

James Sharp, PARKERVILLE, Morris county. I have 300 plum trees in bearing, planted ten years; they are Wild Goose, Lombard, Wolf, Pottawatomie, Damson, Marianna, Abundance, Satsuma, Burbank, Wickson, Red June, German Prune, Washington, Golden Beauty, Robinson, etc. Of Japanese varieties, I have tried Satsuma, Burbank, Abundance, Wild Goose, Red June, and Wickson;

the Burbank does best for me. My surface soil is a black loam, part with red clay subsoil and part with hard, wet subsoil, sloping in all directions. Plant ten and twenty feet. Gather in boxes and baskets and market in baskets and berry boxes in the local towns, receiving from one to two dollars per bushel. I have grown, budded and grafted my own trees. If planting over again, I would put out Wild Goose, Lombard, Burbank, and Damson. My neighbors are growing the same varieties as I. Do not consider it a good paying fruit in this locality. Plums should be planted in the chicken yard, or the curculio will take the crop every year.

V. E. Hathaway, COUNCIL GROVE, Morris county. I have tried the Abundance, Satsuma and Botan plums, none of which are doing well. My soil is a black bottom, about level. I plant fifteen feet apart. The price is so small they do not pay. Have tried a good many varieties, and found but one that paid. If planting over, I would put out the Wild Goose. My neighbors grow plums in a small way. They are not a paying crop in this locality.

F. B. Harris, WHITE CITY, Morris county. I have fifty plum trees in bearing, planted twelve years. They are Washington and Jefferson. The Washington is the best bearer. My soil is a high, level prairie. I plant twenty feet apart. Gather the fruit by hand, and market by the peck or bushel, at Herington, usually receiving two dollars per bushel for them. I have tried wild plums, but find them poor. If I had it to do over again, I would plant Washington and Marianna. My neighbors grow but few plums. I do not consider them a good paying crop on account of the curculio.

C. D. Martindale, SCRANTON, Osage county. I have thirty plum trees in bearing, planted five years ago; they are Wild Goose, Marianna, and Abundance. Of these, the Wild Goose is the best bearer; the Marianna is full this year, Abundance is fairly full. My soil is black loam, with about one foot of gravel, then yellow paint clay and gravel, sloping toward the east. I plant fifteen feet apart. I gather them before quite ripe, and market in grape baskets; sell at Scranton, receiving, usually, two dollars per bushel. I have tried several wild varieties and found them excellent; have an early and a late variety that I got out of the timber and find they improve the grafted sorts. Have never grown, budded or grafted my own trees. If just beginning, I would plant the Wild Goose, Abundance, and some good wild sorts among them, perhaps every fifth or sixth tree. My neighbors grow plums, but not enough for their own use. I do not consider them a good paying crop in this locality.

Howard Morton, TESCOTT, Ottawa county. I have no plum trees in bearing. I had thirteen Weaver planted in a circle with one in the center, close together, about eight feet apart; on a light soil, sloping towards the north; for several years they bore abundantly. I would recommend our native varieties with a few Japanese mixed in; I consider them a good paying crop in this locality, with proper care. My neighbors are growing Wild Goose.

F. T. M. Dutcher, PHILLIPSBURG, Phillips county. I have twelve plum trees in bearing, planted from two to six years; they are Wild Goose, Burbank, and German Prune. Of these, the Wild Goose is the best bearer. My soil is a sandy loam which is nearly level; I plant sixteen feet apart; gather them when ripe; market at home. Have never tried any wild varieties. Have never grown, budded or grafted my own trees. My neighbors do not grow plums; I do not consider them a good paying crop in this locality.

John Hinds, OLCOTT, Reno county. The plum doing best for me is the Miner. My soil is a black, sandy loam, with an eastern slope. I plant twelve feet apart. Gather them the last of August. Sell at home at one dollar per bushel. Have grown, budded and grafted my own trees.

F. A. Smith, BELLEVILLE, Republic county. I have fifty plum trees in bearing, planted from eight to ten years. They are Forest Rose, Marianna, Weaver, and a wild plum from Mitchell county. Of these, the Marianna, Weaver and the wild variety are the best bearers. My soil is a limestone ridge, sloping northwest. I plant the trees eight feet apart. I sell at Belleville, Cuba, and Narka, receiving from fifty cents to one dollar per bushel for them—usually one dollar. I have tried a wild variety, and find it an excellent, free bearer, vigorous, hardy; fruit medium and of good quality. Have never grown, budded or grafted my own trees. My neighbors grow but few plums, mostly for home use. I consider them a good paying crop in this vicinity.

H. C. Hodgson, LITTLE RIVER, Rice county. I have eight plum trees in bearing, planted twelve years. They are the Wild Goose and Miner. The Wild Goose is the best bearer. Of the Japanese varieties, I have Abundance, Burbank, Willard, and Wickson; cannot say which is best, as they have not commenced to bear; they blossomed this spring, but were killed by frost in April. My soil is both upland and bottom. Plant ten feet apart. Have never grown, budded or grafted my own trees. Neighbors do not grow many plums. I do not consider them a good paying crop in this locality.

T. C. Wells, MANHATTAN, Riley county. To raise good plums you need good soil, deeply plowed, free from lumps and well drained, either naturally or artificially. Plums may be divided into three general classes; the European or Golden plum, the Japanese, and the American. It is generally thought that the European plum does best on a clay loam, while the American varieties succeed better on a more sandy soil, but, from my experience, I have learned that plums of each class will thrive in the common black limestone soil of our Kansas prairies. In getting trees for planting, get those with a single main stem; avoid those with forks, as, when loaded with fruit, they are almost sure to split down in heavy winds and be ruined. Get thrifty, stocky trees, with low heads, not more than two or three feet high. On such trees the fruit is more easily gathered and they are in less danger of injury from winds. Plant deep, especially if grafted on peach roots. About sixteen feet apart each way is a good distance. Keep the soil loose and free from weeds, cultivating as deeply as you can without injury to the roots. Keep down all sprouts. Many varieties are not self-fertilizing; therefore different varieties blooming at the same time should be planted near each other. Prune but little, except to shape the tree at first, and afterward to remove dead or interfering branches.

If black knot appears, cut it out and burn it, covering the wound with thick paint. For other diseases, such as leaf rust, shot-hole fungus, and fruit rot, I know of nothing better than thorough spraying with Bordeaux mixture, though this is not always entirely successful. I would spray before the buds swell in spring, again after the blossoms fall, and again still later in the season, if there are any signs of fungus disease. For fruit rot, it is best, besides spraying, to thin the fruit so that no two plums touch each other when full grown. This is important. Thinning should also be practiced on varieties that do not rot, when they set very full; pick off half or two-thirds of the fruit when half grown. What is left will be larger and better flavored, and worth more in the market, and the trees will live longer. For curculio and gouger, the surest way is to jar the trees early in

the morning [which causes them to fall], catching them on sheets and destroying them. Begin this work as soon as the blossoms fall, and continue as long as you catch any. If this is too much trouble and you think it will not pay, the best thing to do is to plant your trees where the chickens will run under them and pick up the "little Turks"; also plant plenty of trees, so that there will be fruit enough for both the insects and yourself. It is also a very good plan to pick up and burn, boil, or otherwise destroy, all wormy and rotten fruit, leaving no insects or fungus spores alive. For canker-worms and other leaf-eating insects add Paris green to the Bordeaux mixture, and spray. If that does not do the work thoroughly, spray again in a day or two. Be sure you get a pure article of Paris green. There are different grades; some of it is adulterated. The best is cheapest in the end. One reason why people do not always succeed in killing canker-worms is that they do not begin spraying early enough. The young worms are much more susceptible to poison than when they are nearly or quite full grown.

Most varieties of plums are of better flavor if they remain on the trees until fully ripe. For market, however, they must be gathered before they get soft, but they should be full grown and pretty well colored. As to varieties suitable to the climate and soil of Kansas, I can only judge from my limited experience and observation. Of the European varieties, the Lombard and Spaulding are the only ones that I have had in bearing. They set plenty of fruit, which is of fair quality when ripe, but they are not curculio or rot proof, and in some seasons, in spite of spraying or anything that I have done, the amount of sound, ripe fruit has been very small. Of the Japan plums, the Burbank has proved most worthy of cultivation. It is of large size and good quality, especially for cooking, and an abundant bearer. Indeed, it usually sets so much fruit as to require severe thinning. The Abundance and Botan are good, but have not been such sure or abundant bearers as the Burbank. The Ogon seems more hardy than any of the Japan plums, but the quality is hardly as good as those mentioned above. It is a good bearer. The Satsuma and *simonii* have been unproductive and unprofitable. Of our native American varieties, the following, I think, are worthy of cultivation: Wild Goose, Miner, Bluemont, Golden Beauty, and Moreman. The Bluemont sometimes rots badly. All need to be thoroughly ripe before they are good to eat without cooking. I have found no curculio-proof plum. Besides those mentioned above, the following are grown on the grounds of the Kansas State Agricultural College and are thought worthy of cultivation—all are American: Wyant, Weaver, Wayland, De Soto, Robinson, and Clayton.

M. E. Wells, SMITH CENTER, Smith county. Have fifty plum trees in bearing which have been planted seven years; those doing best for me are a wild variety; soil is a clay loam, sloping to the east; sandy bottom next to creek is best. Plant ten feet apart. Sell at the orchard, receiving one dollar per bushel. Have never grown, budded or grafted my own trees. I would keep a new orchard clean for three years, then mulch with straw a foot deep. Neighbors are growing a few plums. I consider them a good paying crop in this locality.

D. M. Adams, ROME, Sumner county. I have a dozen plum trees in bearing, planted twelve years; they are Marianna and Wild Goose; they are profitable for home use only. My soil is prairie, sloping to the southeast. Have tried several wild varieties, and find some to be very good. Have never grown, budded or grafted my own trees. If planting over, I would set out the above-named varieties and the Abundance and German Prune. Neighbors are growing them only for home use.

A. M. Dull, WASHINGTON, Washington county. I have thirty-five plum trees in bearing, planted six years; they are Wild Goose, Pottawatomie, Wolf, and De Soto. The best bearers are Wild Goose and Pottawatomie. My soil is upland prairie, sloping to the north. Planted my trees 10x15 feet. We use all the fruit at home. I have tried one wild variety, but found it to be a poor bearer. Have never grown, budded or grafted my own trees. If planting over, I would set out Wild Goose, Pottawatomie, and perhaps one or two other varieties; would plant them in a block, and when they come into bearing I would fence, and turn in the chickens, as I think they would destroy the curculio and other insects. My neighbors grow a few plums. Do not consider them a good paying crop in this locality.

W. D. Cellar, EDWARDSVILLE, Wyandotte county. I have 1200 plum trees in bearing, planted from four to nine years. The varieties are: American class—Wild Goose and Miner; Japanese class—Abundance, Burbank, Red June, and also a few Damson. The Wild Goose do best for me; of the Japanese varieties the Abundance and Burbank are the best bearers. My soil is a hazel bottom, with clay subsoil, sloping towards all directions. I plant fifteen feet both ways. When gathering I shake them on the ground or on sheets, and market in twenty-four quart crates and one-third-bushel boxes; in Kansas City and towns in Missouri, Kansas and Colorado they usually bring from 50 cents to \$1.50 per crate, or 25 to 75 cents per one-third-bushel box. I always grow, bud and graft my own trees. If I were going to do it all over again, I would plant as I now grow, excepting only a few Miners to fertilize, and none at all of this variety if I could find a better fertilizer for Wild Goose. My neighbors grow plums to some extent. I consider them a good paying crop.

F. Holsinger, ROSEDALE, Wyandotte county. Of the many varieties tried, few have succeeded. Those that give the best—I might say the only satisfaction—are the Chickasaw varieties; of these, the Pottawatomie stands first. The Wild Goose during past few years was among the best. Owing to the attack of insect enemies, the curculio and gouger, plum growing has become precarious. Of European sorts, I know of none that are worth planting; of Japanese sorts, all save one (Gold) have succumbed to the severity of winter; but for the occasional severe winters, plum growing would succeed, providing sufficient care was exercised to fight the insects. Jarring affords best protection—use of sheets upon which the curculio and gouger fall when the tree is suddenly jarred; then picking them into bottles they are easily destroyed by scalding. Unless you are intending to follow out the best methods of fighting insects, you will find plum growing unsuccessful; for while you may produce this fruit in abundance, it will be unsatisfactory and unsalable because of its faulty condition.

A DESCRIPTIVE LIST OF THE NUMEROUS VARIETIES OF PLUMS.

Aitkin.—Fruit very large, oval, slightly truncate at both ends, suture very obscure; skin nearly uniform, deep dark red, without dots, a little paler on shade side; flesh rich yellow, rather firm, sweet, moderately rich; skin very thin and tender, may be eaten with impunity, and is without harshness when fruit is fully ripe; stone large, but remarkably thin, obscurely margined. Leaves broad, with glandular stalks. Tree very vigorous; reported productive. Season very early. Found wild in Aitkin county, Minnesota. Introduced in 1896 by Jewell Nursery Company, Lake City, Minn. The reports thus far received from this plum are very favorable.

American Eagle.—Very large; skin dark purplish-red when fully ripe; form roundish oblong; cling. One of the finest of the group. Leaves rather large, the stalks glandular. Introduced by Osceola Nursery Company, Osceola, Mo. Good for market. Likely the best *americana*.

Apple Plum.—From the garden of D. U. Pratt, Chelsea, Mass. Fruit medium, roundish flattened, a little swollen on one side, suture medium; skin reddish purple, with a blue bloom and light dots; flesh greenish yellow, a little coarse, sweet, sprightly, with considerable austerly at the skin; adheres partially to the stone. Good. September. (Downing.)

Bavay.—Tree grows very strongly, and is one of the hardiest of the *domestica* class. Sets some fruit almost every year, but is not sufficiently hardy for this situation. It can be grown wherever peaches will bear a crop. The fruit is of best quality; season late—September 5 to 15.

Bingham.—Large (an inch and three-fourths long), oval, rather widest at base; surface deep yellow, with rich red spots to the sun; stalk slightly sunk; flesh yellow, juicy, rich, delicious. Season of ripening, medium or end of summer and first of autumn. Shoots downy. Handsome, productive, and valuable. Pennsylvania. (Thomas.)

Botan.—(See Abundance.)

Caddo Chief.—Small, round, red; very early. Louisiana. Chickasaw. (Thomas.)

Hawkeye.—Large, round-oblong, purple-red; skin thick; flesh firm; good; cling. Mid-season. Iowa. (Thomas.)

Cheney.—Large to very large, round-oblong; dull purple-red; skin thick; flesh firm, sweet, good; cling. Ripens in August. Wisconsin. (Thomas.)

City.—Large, red on yellow ground, productive; perfect freestone; skin thick and bitter; ripens with De Soto; lacks attractive color. Hardy, good bearer; sells well in local market. Has withstood frost better than any other. More valuable for home use than market. Well reported by all. Minnesota.

Chickasaw.—Fruit about three-fourths of an inch in diameter, round, and red or yellowish-red, of a pleasant, subacid flavor; ripens pretty early; skin thin.

The branches are thorny, the head rather bushy, with narrow, lanceolate serrulate leaves, looking at a little distance somewhat like those of a peach tree. It usually grows about twelve or fourteen feet high; but on the prairies of Arkansas it is only three or four feet high, and in this form it is also common in Texas. The Dwarf Texas plum described by Kendrick is only this species. It is quite ornamental. (Downing.)

Climax.—Cross of *simonii* and Botan; very large, measuring $6\frac{1}{2} \times 7\frac{1}{2}$ inches in circumference, heart-shaped; a superbly rich plum, extremely early; ripens in the coast counties early in July, before any other good plum; color of flesh yellow; sweet and delicious, with a pineapple fragrance; skin thick, firm, deep vermilion-red, with very minute white specks; stem short, strong; pit medium to large, separates easily from flesh. Tree a vigorous grower, very productive; branches and leaves resemble the Heart cherries in size and vigor. This is destined to become the best shipping plum that has come to my notice. Originated by Luther Burbank, of Santa Rosa.

Damson (Common, Black, Purple, Early, etc.)—The common oval Blue Damson is almost too well known to need description, as thousands of bushels are annually sold in the market for preserves. The tree is enormously productive, but in the hands of careless cultivators is liable to be rendered worthless by the knots, which are easily extirpated if the diseased branches are regularly burned every winter or spring. Branches slender, a little thorny and downy. Fruit small, oval, about an inch long. Skin purple, covered with thick blue bloom. Flesh melting and juicy, rather tart; separates partially from the stone. September. As the Damson is frequently produced from seed, it varies in character. The Shropshire or Prune Damson is an English purple variety, rather obovate in form, but little superior to our common sort. The Sweet Damson resembles the Common Damson, and is but slightly acid. The Late Black Damson, Late Purple Damson, Prines's Early Damson, Small Red Damson, Small White Damson and Large White Damson are also varieties not of sufficient value or distinctiveness to render separate description necessary. The Winter Damson is a valuable market sort from its extreme lateness. It is small, round, purple, covered with a very thick light-blue bloom. Flesh greenish, acid, with a slight astringency, but makes good preserves. It bears enormous crops, and will hang on the tree until the middle of November, six weeks after the Common Damson, uninjured by the early frosts. (Downing.)

De Soto.—Large to very large, round-oblong, slight suture; red, slight purplish bloom; skin thick, flesh orange color, firm, juicy, good; cling. Late. Wisconsin. (Thomas.)

Fellenberg (Prune d'Italie, Italian Prune, Quetsche d'Italie, Altesse Double, Italian Quetsche).—Tree vigorous, spreading; branches smooth; fruit medium, oval; suture moderate; skin dark blue, with a bloom; stalk an inch long, rather stout, inserted in a very small cavity; flesh dark yellow, juicy, sweet, and good; separates from the stone. Good. First of October. (Downing.)

Forest Garden.—Large, round-oblong, orange yellow, overlaid and dotted red; skin medium, thick; flesh moderately firm, orange color, fibrous, juicy, good; cling; stem slender, short. Tree forked and inclined to split. Not good east of Illinois. Good for home use. August. Illinois. (Thomas.)

General Hand.—Origin uncertain; supposed to have originated on the farm of General Hand, near Lancaster, Pa. Tree very vigorous; branches

smooth; fruit very large, roundish, oval; suture obscure, running half round; skin deep, golden yellow, slightly marbled with greenish yellow; stalk long, set in a shallow cavity, the whole of that end being flattened; flesh coarse, pale yellow, moderately juicy, sweet and good, but not of high flavor; separates freely from the stone. Good. September. (Downing.)

Golden Beauty.—Medium, round ovate, pointed at apex, deep clear yellow; skin thick; flesh amber, firm, sweet; semicling. Late bloomer, and in ripening. Tree hardy, vigorous, productive. Good. Texas. (Thomas.)

Green Gage.—This plum has thirty-six synonyms. The Green Gage is everywhere highly esteemed. In France it is generally known as the Reine Claude, having, it is said, been introduced into that country by Queen Claude, wife of Francis I. During the last [eighteenth] century an English family by the name of Gage obtained a number of fruit-trees among the monks of Chartreuse, near Paris. Among them was a tree of this plum, which, having lost its name, was called by the gardener the Green Gage. It is pronounced by Lindley the best plum in England. The Green Gage is a very short, slow-growing tree, of spreading and rather dwarfish habit. It is an abundant and pretty regular bearer, though the fruit is liable to crack upon the tree in wet weather. Branches smooth. Buds with large shoulders. Fruit round, rather small, seldom of medium size. Suture faintly marked, but extending from the stalk to the apex. Skin green, or yellowish green at full maturity, when it is often a little dotted or marbled with red. Stalks half to three-fourths inch long, slender, very slightly inserted. Flesh pale green, exceedingly melting and juicy, and usually separates freely from the stone. Flavor at once sprightly and very luscious. Best. Ripe about the middle of August. There are several seedling varieties of this plum in various parts of this country, but none superior or scarcely equal to the old. (Downing.)

Hale (Burbank No. 3, Prolific).—Medium, globular; light orange red; flesh yellow, firm, spicy, sweet; cling. Very late. (Thomas.)

Heikes.—Much like Late Blood, but rather more flattened on the ends, or oblate, mostly darker in color, the flesh acid. Little known. Named for W. F. Heikes, of the Huntsville Nurseries, Huntsville, Ala.

Indiana Red.—Large, round; cling. Indiana Horticulture. (Thomas.)

Kelsey.—Very large, two to three inches in diameter, heart-shaped, lopsided, distinct suture; yellow, overlaid bright-red purple, dotted; flesh light yellow, firm, rich, free, usually hollow. Not hardy North. A good canning fruit. (Thomas.)

Kerr (Hattonkin No. 2).—Medium, conical, sutured; bright yellow; flesh yellow, juicy, subacid; cling. Prolific. Probably not hardy North. (Thomas.)

Klondike.—Earliest of all; ripe and gone by August 1. Golden yellow; freestone. Originated in Iowa by cross-pollination. Introduced, 1897, by W. F. Heikes, Huntsville, Ala. Wragg, Iowa.

Le Duc.—Medium, round, flattened; orange, spotted red; skin thin; flesh soft, sweet; semicling. Mid-season. Minnesota. (Thomas.)

Lombard (Bleecker's Scarlet, Beekman's Scarlet, Montgomery Prune).—Tree very vigorous, hardy; has strikingly crimped leaves, bright, purple, glossy shoots, very productive; popular. It was called the Lombard plum by the Massachusetts Horticultural Society in compliment to Mr. Lombard, of Springfield,

Mass., who first brought it into notice in that state, and it is said to have been received by him from Judge Platt, of Whitesborough, N. Y., who raised it from seed. But it was previously well known here by the name of Bleecker's Scarlet. Never having been described under that name, however, we adopt the present title. Fruit of medium size, roundish oval, slightly flattened at either end. Suture obscure. Stalk quite slender, scarcely three-fourths of an inch long, set in a broad, abruptly narrow cavity. Skin delicate violet-red, paler in the shade, dotted with red, and dusted thinly with bloom. Flesh deep yellow, juicy, and pleasant, but not rich, adhering to the stone. Good. Middle and last of August. (Downing.)

Lone Star.—Medium, round-oblong, red; very thin skin. Texas. Chickasaw. (Thomas.)

Mankato.—Fruit very slightly oblong, inclining to truncate at stem end; suture rather distinct; dull red, densely dotted with very minute yellowish specks; flesh yellow, sometimes red next the stone, sweet and rich; skin rather thick with very slight harshness, easily separable from the flesh; stone thick, with convex sides, rounded at ends, obscurely margined; semi-cling; season late; leaves medium, broad, smooth, sharp serrate, glandless. Tree thrifty, symmetrical, fairly productive; bears young.

Marianna.—Large, round-oblong; red, yellow specks, fine bloom; flesh soft, juicy, sweet; semi-cling. Not especially valuable for the fruit. The facility, however, with which this plum may be propagated from cuttings, and readiness with which the union takes place in grafting upon it, have made it a most common stock. It is supposed to be a seedling of some European plum. Originated in Texas. (Thomas.)

Maru.—Medium, round, slightly pointed; yellowish red; flesh yellow, melting, juicy, subacid; free. (Thomas.)

McLaughlin.—Raised by James McLaughlin, Bangor, Me. Tree hardy, vigorous, and productive; a valuable variety, nearly or quite equal to Green Gage. Branches smooth. Fruit large, nearly round, oblate, flattened at both ends; suture slight; stalk three-fourths of an inch long, inserted in a small cavity by a ring; skin thin and tender, yellow, dotted and marbled with red on the sunny side, and covered with a thin bloom; flesh deep yellow, rather firm, juicy, very sweet and luscious, perfumed; it adheres to the stone. Best. Last of August. (Downing.)

Moreman.—Medium, round, dark red. Horticulana. (Thomas.)

Munson (Hytan, Kayo, Douglas).—Medium, oblong; pale red; skin thin, tough; flesh yellow, melting, acid. Free, hardy, and productive; good South. (Thomas.)

Myrobalan (Cherry, Early Scarlet).—Small (one inch in diameter), round, remotely heart-shaped; bright red, bloom faint; stalk short and slender; cavity narrow; flesh juicy, slightly fibrous, soft, melting, subacid; not rich, adhering to the oval, pointed stone. Ripens very early, or about midsummer—its only value. Distinguished by its smooth, slender, small, bushy head and narrow leaves. There are many varieties. This plum is considered to be a variety of the *P. domestica*. It has long been a favorite stock for other plums, and immense numbers have been imported into this country. As it dwarfs the scion, however, it is not so much used as formerly.

Newman.—A variety of the Chickasaw family that has recently come into notice through D. L. Adair, of Kentucky. Tree healthy, hardy, vigorous, and productive. Fruit medium, roundish oval; skin light scarlet, with a thin bloom; flesh soft, light pinkish, vinous, juicy; adheres to the stone. Early August. (Downing.)

Niagara.—Medium, oval, dark purple; flesh pale yellow, juicy, sweet, free. September. (Thomas.)

Moore's Arctic.—Below medium, roundish oval, dark purple, with a pleasant but not rich flavor. Early autumn. Tree healthy, vigorous, extremely hardy, a great bearer. Maine. (Thomas.)

Normand (Normand Yellow, Normand Japan).—Medium, conical, heart-shaped, golden yellow; flesh yellow, firm, and good; free. (Thomas.)

Ogon (Oyon, Shiro-smomo, White Plum).—Medium, roundish, oblate, distinct suture; golden yellow, with creamy bloom; flesh thick, firm, not juicy; free. Keeps long; good canner. Mid-season. (Thomas.)

Peach Plum (Nectarine, Caledonian, Howell's Large, Jenkin's Imperial, Prune Pêche, Louis Philippe).—Tree vigorous, upright; stout, blunt, purplish shoots, nearly smooth. A fine-looking fruit, of foreign origin, but only of second quality. Fruit of the largest size, regularly formed, roundish; stalk about half an inch long, rather stout, and set in a wide, shallow depression; skin purple, dusted with a blue bloom; flesh dull greenish yellow, becoming tinged with red at maturity, a little coarse-grained, with a rich, brisk flavor, and adhering partially to the stone; good. Middle of August. (Downing.)

Poole (Poole's Pride).—Medium, round-oblong, red with bloom, sweet, good; hardy, prolific. (Thomas.)

Pottawatomie.—Medium, round, red, streaked yellow; stem long, slender; flesh firm, juicy. Very productive. Mid-season. Tennessee. (Thomas.)

Quakenboss.—Introduced by Mr. Quackenboss, of Greenbush, N. Y. Origin in the garden of S. C. Groot, Albany. A very rapid, upright grower, and productive. Branches smooth; fruit large, oblong-roundish; skin deep purple, covered with a bluish bloom; suture scarcely apparent; stalk long, slender, and set in a slight depressed cavity; flesh greenish yellow, sprightly, juicy, and a little coarse-grained, sweet and subacid; adheres slightly to the stone. Good. September. (Downing.)

Quaker.—Very large, round-oblate, flattened; purple-red, orange on side, blue bloom; skin thick, astringent; flesh firm, sweet, juicy; semi-cling; very good. Mid-season. Requires good cultivation and thinning. Iowa. (Thomas.)

Red Negate.—(See Red June.)

Robinson (Miner, Hickley, Isabel, Gillett, Townsend).—This is an improved variety of the wild or Chickasaw plum, originated with Mr. Miner, Lancaster, Pa. Branches smooth, dark red; fruit medium, oblong, pointed at apex; skin dark, purplish red, with a fine bloom; flesh soft, juicy, vinous; adheres to the stone. Early October. (Downing.)

Rockford.—Trees planted in 1894 are still rather small, but thrifty in appearance, forming round, regular tops. Leaves large, coarsely and deeply serrate, short acuminate; stalks dark red, pubescent, mostly glandless. Fruit of medium size, oblong, somewhat pointed, broad at base; color dark red on green ground; skin thin; suture inconspicuous; flesh firm, very acid until quite ripe, then of

good quality; stone cling, broad at stem end and tapering to a rather acute, thick apex, sides strongly convex, margin narrow, but sharp. Productive; early; ripe August 31.

Rollingstone.—Very large, round, flattened, truncated at ends; mottled and spotted pink-purple; flesh firm, sweet, good; semicling. Mid-season. A very popular Western plum. Iowa. (Thomas.)

Satsuma (Blood, Yonemomo).—Medium, roundish-conical, more or less sharp apex, deep suture; very dark red, blue bloom, greenish dots; flesh blood-red, rather coarse, subacid; cling. Blooms early; midsummer; productive. (Thomas.)

Stoddard (Native).—One of the largest, perhaps the largest, of the native plums originated in Iowa. It is of light pinkish-red color, very handsome, with a tough, sweet skin, and of most excellent quality. (Sedgwick Nursery Company.)

Surprise.—A variety very recently introduced by Mr. Martin Penning, of Sleepy Eye, Minn., and perhaps finest in quality of all the cultivated native plums.

Best plum I have seen in this state; large, deep, meaty, fine flavor. Tree thrifty, productive; early September; do not think it *americana*. (Harris, Minn.)

It may be a hybrid of Miner and *americana*, but resembles Miner in tree, fruit, and leaf. Appears to be hardiest of that type. (Heideman, Minn.)

Best of my collection. Bears well and sells well. (Penning, Minn.)

One of the very best in all respects; equal to any on my grounds. (Lord, Minn.)

Washington (Bolmar, Bolmer, New Washington, Bolmer's Washington, Franklin, Irving's Bolmar, Jackson, Parker's Mammoth, Washington Jaune, Philippe I).—The Washington, although not equal to the Green Gage and two or three others in high favor, yet its great size, its beauty and the vigor and hardness of the tree are qualities which have brought this noble fruit into notice everywhere. The parent tree grew originally on Delancey's farm, on the east side of the Bowery, New York, but, being grafted with another sort, escaped notice until a sucker from it, planted by Mr. Bolmer, a merchant in Chatham street, came into bearing, about the year 1818, and attracted universal attention by the remarkable beauty and size of the fruit. In 1821 this sort was first sent to the Horticultural Society of London, by the late Doctor Hosack. The Washington has remarkably large, broad and glossy foliage, is a strong grower, and forms a handsome round head. Wood light brown, downy. Fruit of the largest size, roundish oval, with an obscure suture, except near the stalk. Skin dull yellow, with faint marblings of green, but when well ripened, deep yellow, with a pale crimson blush or dots. Stalk scarcely three-fourths of an inch long, a little downy, set in a shallow, wide hollow. Flesh yellow, firm, very sweet and luscious, separating freely from the stone. Good to very good. Middle to the last of August. (Downing.)

Wayland.—Large, round-oblong; light red; skin medium thick and shiny. Very late; good for Southern states. Kentucky. (Thomas.)

Whitaker.—Large, red, seedling of Wild Goose. Texas Horticultural. (Thomas.)

Wickson.—Medium; glowing carmine, with heavy white bloom; flesh yellow, firm, spicy, subacid; cling. Good. Ships well. A cross of Kelsey and Burbank. (Thomas.)

Wild Goose.—Large, round-oblong, light red, skin thin; cling; stone long and narrow, prolonged above into a sharp point and below into a narrow base, finely pitted; flowers medium to large, stalked; leaves oblong-lanceolate, peach-like, not prominently pointed, the margins finely and evenly serrate, and the stalks usually bearing two to four small glands. Early. Quality poor, but on account of its productiveness, earliness, beauty, good shipping qualities and its early introduction it is the most popular of the native plums. The Wild Goose was first brought to notice by James Harvey, of Columbia, Tenn. Some time before 1850 a man shot a wild goose near Columbia, and on the spot where the carcass was thrown this plum came up the following spring. It was introduced about 1850 by the late J. S. Downer.

Willard (Botan No. 6).—Medium, roundish, dark red, numerous small yellow dots; flesh yellow, sweet; free. Productive; very early. (Thomas.)

Wolf.—Medium, round, yellow mottled red; skin thick; flesh yellow, firm, fibrous, good; free. Tree strong grower, prolific. Good for home and market. Iowa. (Thomas.)

Wyant.—Trees stocky, forming round heads, of slower growth than Wolf or Weaver. Leaves medium, crisp in texture, sharply serrate, dark green; stalks pubescent and glandular. Fruit large, round-oblong, flattened at apex; cavity large and deep; color purple red on yellow ground; stem short, stout; skin thick; flesh firm, of good flavor; stone free or nearly so, large, oblong, flat. Ripe September 18.

Yellow Egg.—The White Magnum Bonum, or Egg plum, as it is almost universally known here, is a very popular fruit, chiefly on account of its large and splendid appearance, and a slight acidity, which renders it admirably fitted for making showy sweetmeats or preserves. When it is raised in a fine warm situation, and is fully matured, it is pretty well flavored, but ordinarily it is considered coarse, and as belonging to the kitchen and not to the dessert. Branches smooth, long. Fruit of the largest size, measuring six inches in its longest circumference, oval, narrowing a good deal to both ends. Suture well marked. Stalk about an inch long, stout, inserted without cavity in a folded border. Skin yellow, with numerous white dots, covered with thin white bloom; when fully ripe, of a deep gold color. Flesh yellow, adhering closely to the stone, rather acid until very ripe, when it becomes sweet, though of only second-rate flavor. Stem long and pointed at both ends. A pretty good bearer, though apt in light soils to drop from the trees before matured. Middle of August. (Downing.)

Yosete (Earliest of All).—Small, conical, distinct suture; dark purple-red; flesh yellow; free. (Thomas.)

PLUMS FOR THE TABLE.

A FEW STANDARD RECIPES.

Butter.—Select mellow plums; pare and stone; weigh, and to every pound allow three-quarters of a pound of sugar. Put the plums in a porcelain-lined kettle; heat slowly; mash and stir until perfectly smooth, then press through a fine sieve; add the sugar; boil for fifteen minutes, stirring constantly. Put into jars, and tie up. (Canning and Preserving, by Mrs. Rorer.)

Canned.—Allow three-quarters of a pound of sugar to every pound of plums. Put in a porcelain-lined kettle; cook sufficient to fill one jar only at a time; bring slowly to boiling-point; simmer until the plums are soft, without being broken, skim and can. All large plums may be canned in the same manner, first pricking the skins to prevent cracking. (Canning and Preserving, by Mrs. Rorer.)

Canned.—Wash and put whole in a syrup made in the proportion of a pint of water and a pound of sugar to every two pounds of fruit; boil for eight minutes; can and seal immediately. If pricked with a fork before putting in the syrup, they will be less liable to burst. Cherries are canned in the same way. (Buckeye Cookery.)

Charlotte.—Stone a quart of ripe plums, and mix them with a pound of brown sugar. Cut slices of bread and butter, and lay them around the sides and in the bottom of a large, deep dish. Pour in the fruit boiling hot, cover the bowl, and set it away to cool gradually. When quite cold, serve with sweet cream. This is very nice in hot weather. (Skilful Housewife's Book.)

Cheese.—Bake the fruit in a stone jar, with a few of the kernels to flavor it; then pulp it through a coarse sieve, and to each pound of pulp, free from stone and skin, add a half pound of powdered loaf sugar, in a pan; boil and skim till the sides candy, when pour the cheese into shallow pans, previously rubbed with butter, and tie them over. (Mrs. Hale.)

To Prepare Fruit for Children.—A far more wholesome way than in pies or puddings, is to put apples sliced, or plums, currants, gooseberries, etc., into a stone jar, and sprinkle among them as much sugar as necessary. Set the jar in an oven, with a teacup of water to prevent the fruit from burning; or put the jar into a saucepan of water till its contents be perfectly done. Slices of bread or some rice may be put into the jar to eat with the fruit. (Mrs. Hale.)

Cobbler.—Take one quart of flour, four teaspoons melted lard, one-half teaspoon of salt, two teaspoons of baking-powder; mix as for biscuits, with either sweet milk or water, roll thin, and line a pudding dish or dripping-pan, nine by eighteen inches; mix three tablespoons of flour and two of sugar together, and sprinkle over the crust; then pour in three pints of canned plums, and sprinkle over them one coffee cup of sugar; wet the edge with a little flour and water mixed, put on the upper crust, press the edges together, make two openings by cutting two incisions at right angles an inch in length, and bake in quick oven one-half hour. (Miss S. Alice Melching, Buckeye Cookery.)

Compote.—Boil six ounces of sugar with half a pint of water to each pound of plums, the usual time; simmer the plums very softly for twenty minutes; in-

crease the proportion of sugar if needed, and regulate the time as may be necessary for different varieties of the fruit. (Mrs. Hale.)

Compote.—Four ounces of sugar and half a pint of water, to be boiled ten minutes; one pound of plums to be added, and simmered gently for ten or twelve minutes. (Mrs. Hale.)

Dried.—Fruits for drying should be perfect and quite ripe. Cut in halves and take out the stones. It is best not to pare them. Spread in a single layer on boards, and stand in the hot sun to dry gradually until they turn leather-colored; bring in always before sunset, and never put out in damp or cloudy weather; a piece of mosquito netting will prevent flies from reaching them; when dry put into paper sacks and hang in a dark, dry, cool place. Cherries should be stoned before drying. All fruits may be dried in the oven, providing the oven is not sufficiently hot to scorch or scald. This is an excellent way, as the fruit is dried more quickly and you escape the danger of its being stung by insects. (Canning and Preserving, by Mrs. Rorer.)

Euchered.—Nine pounds blue plums, six pounds of sugar, two quarts of vinegar, one ounce of cinnamon; boil vinegar, sugar and spice together; pour over plums, draw off next morning and boil, pour back on plums; repeat the boiling five mornings, the last time boiling the fruit in it about twenty minutes. (Mrs. Capt. W. B. Brown, Washington city, Buckeye Cookery.)

Jam.—Stew plums in a little water and press through a colander or coarse sieve, adding a little water to get all the pulp through; add three-fourths pound sugar to each pound of pulped plums; boil three-quarters of an hour, stirring constantly; pour into jars or bowls, and cover with paper, pressed to fit each jar or bowl, down close, and then larger papers, brushed on the inside with the white of eggs, with the edges turned down over the outside of the glass.

Jelly.—For this use common blue plums. Wash in cold water, put in a porcelain-lined kettle, and to every half peck allow a pint of water; cover and heat until soft and tender; then turn into a flannel jelly-bag, and drip slowly until the pulp is dry. Do not squeeze or handle the bag, or the jelly will be cloudy. To every pint of juice allow one pound of granulated sugar. Put the juice into a porcelain-lined kettle, and bring quickly to a boil; add the sugar, stir until dissolved; boil rapidly and continuously until it jellies, skimming constantly; twenty minutes is usually sufficient, but sometimes I have boiled it thirty-five minutes before it would jelly properly. It is wise to commence testing after fifteen minutes' boiling. To do this, take out one teaspoon of the boiling jelly, pour it into a saucer, and stand in a cool place for a moment; then scrape to one side with a spoon—if jellied, the surface will be partly solid; if not, boil longer, and try again. As soon as it jellies, roll the tumblers quickly in boiling water, and fill with the boiling liquid. Stand aside until cold and firm (about twenty-four hours). Then, if you have jelly tumblers, put on the lids; if not, cover with two thicknesses of tissue paper, and paste the edges of the paper down over the edge of the tumbler. Then moisten the top of the paper with a sponge dipped in cold water. This moistening stretches the paper, so that when it dries again it shrinks and forms a covering as tight and smooth as bladder skin. I do not recommend covering with brandied paper, as it has not been satisfactory. The jelly, in cooling, forms its own air-proof covering. Keep in a cool, dark place.

Jelly.—If plums are wild (not cultivated), put in pan, sprinkle with soda, and pour hot water over them; let stand a few moments and stir; take out, and

put in with water to cover them—less if plums are very juicy; boil till soft, dip out juice with a china cup, then strain the rest through jelly-bags; do not squeeze them. Take pound for pound, or pint for pint, of juice and sugar; boil eight to ten minutes. Jelly will be nicer if only one measure or a measure and a half is made at once; if more, boil longer. Some boil juice ten or fifteen minutes, then add sugar and boil five minutes. Test by dropping some in a saucer and placing on ice or in a cool place; if it remains rounded and does not spread, it is finished. If the plums are tame, discard the soda. Take the plums that are left and press through a sieve, boil half an hour, then take pint for pint of sugar and pulp, boil ten or fifteen minutes more. Half a pint sugar to a pint makes a rich marmalade, and one-third pint to pint, boiling it longer, is nice canned and used for pies, adding milk, eggs and sugar, as for squash pies. (Buckeye Cookery.)

Plum-and-apple Jelly.—This may be made by preparing the juice of one part plums to two parts apples, as above, and finish without flavoring. Marmalade is made the same way as above. Some add a little ginger root to it. One bushel of apples and one peck of plums make forty pints of jelly and sixteen quart glass cans of mixed marmalade. In making either kind of jelly, the fruit may be squeezed and the juice strained twice through swiss or crinoline and made into jelly. The pulp is not then fit for marmalade. (Buckeye Cookery.)

Marmalade.—When the plums are thoroughly ripe, take off the skins, weigh, and boil them quickly without sugar for fifty minutes, keeping them well stirred; then to every four pounds add three of good sugar, boil the preserve from five to eight minutes longer, and clear off the scum perfectly before it is poured into the jars. When the flesh of the fruit will not separate easily from the stones, weigh, and throw the plums whole into the preserving pan, boil them to a pulp, pass them through a sieve, and deduct the weight of the stones from them when appropriating the sugar to the jam. Any other plum may be substituted for Green Gages, in this receipt. Green Gages, stoned and skinned, six pounds, fifty minutes; sugar, four and one-half pounds, five to eight minutes. (Mrs. Hale.)

Marmalade.—Rub the fruit, but do not pare it. Cut in halves, remove the stones, and to each pound allow a half pound of sugar. Put the fruit into a porcelain-lined kettle, with sufficient water to cover the bottom, cover, and heat slowly to boil; then stir, and mash fine, add the sugar and three or four kernels, blanched and pounded to a paste, to every quart of marmalade. Boil for fifteen minutes, stirring continually; then stand over a more moderate fire, and cook slowly twenty minutes longer. Stir occasionally, that it may not scorch. Put away in stone jars. (Canning and Preserving, by Mrs. Rorer.)

Preserves.—Allow equal weight sugar and plums; add sufficient water to the sugar to make a thick syrup, boil, skim, and pour over the plums (previously washed, pricked, and placed in a stone jar), and cover with a plate. The next day drain off the syrup, boil, skim, and pour in over plums; repeat this for three or four days; then place plums and syrup in preserving kettle, and boil very slowly for half an hour. Put up in stone jars, cover with paper, like jellies, or seal in cans.

Preserves.—Plums may be preserved nice with the skins on or off. If on, they should be pricked at the top and bottom with a large needle; to take them off, turn boiling water over them. Plums require a pound and a half of sugar to

a pound of fruit; prepare your syrup thick and lay in your plums to simmer, not to boil; let them remain in a scalding state until cooked through, at least two hours; then skim out and boil the liquor down about an hour; it must be thick to keep well. The flavor will be much improved by boiling in the syrup one-half pint of the kernels, cracked; they must be strained out. Plums may be hardened by scalding them in alum water, and, when drained, pouring the hot syrup over them every day for a week; but, if done with care, they will remain whole preserved as above. (*Skillful Housewife.*)

Preserved.—Weigh, and to each pound allow a pound of sugar. Put them in boiling water for a few moments, until the skin comes off easily; peel and throw them into a large earthen bowl or jar, sprinkling sugar between each layer; let stand over night. In the morning carefully pour off the juice into a porcelain-lined kettle; bring quickly to a boil; skim and then add the plums; simmer gently about thirty minutes until tender and clear; take out one by one with a spoon and spread on dishes to cool; boil the syrup a few minutes longer until thick. When the plums are cool, put them into tumblers or jars, pour the boiling syrup over, and seal or tie up. Yellow Gages, copper plums, prunes and blue plums may be preserved in the above manner. (*Canning and Preserving, by Mrs. Rorer.*)

Preserve.—To every pound of Damsons allow three-fourths of a pound of powdered sugar; put into jars, or well-glazed earthen pots, alternately a layer of Damsons and one of sugar; tie strong paper or cloth over the pots and set them in the oven after the bread is drawn, and let them stand until the oven is cold. The next day strain off the syrup, and boil it till thick; when it is cold put the Damsons into small jars or glasses, pour over the syrup, which should cover them, and tie a wet bladder or strong cloth over them. (*Mrs. Hale.*)

Pudding.—Stew plums, fresh or dried, with sugar to taste, and pour hot over thin slices of baker's bread with crust cut off, making alternate layers of fruit and bread, and leaving a thick layer of fruit for the last. Put a plate on top, and when cool set on ice; serve with sifted sugar, or cream and sugar. This pudding is delicious made with Boston or milk crackers, split open, and stewed apricots, with plenty of juice, arranged as above. Or, another way, is to toast and butter slices of bread, pour over it hot stewed fruit in alternate layers, and serve warm with rich hot sauce. (*Mrs. L. S. W., Buckeye Cookery.*)

Spiced.—The plums should be pricked before cooking. Seven pounds of fruit, four pounds of sugar, one pint of vinegar, one-half ounce of ginger root, one teaspoonful of ground cloves, two teaspoonfuls of allspice, two teaspoonfuls of cinnamon, one-half teaspoonful of ground mace. Put the vinegar and sugar on to boil; mix the spices and divide them into four parts; put each into a small square of muslin, tie tightly, and throw them into the sugar and vinegar. When this mixture is hot, add the fruit; bring to boiling-point, take from the fire, and turn carefully into a stone jar. Stand in a cool place over night. Next day, drain all the liquor from the peaches into a porcelain-lined kettle, stand it over a moderate fire, and, when boiling, pour it back into the jar over the plums or cherries. Next day, drain and heat again, as before, and do this for nine consecutive days, the last time boiling the liquor down until there is just enough to cover the fruit. Add the fruit to it, bring the whole to a boil, and put in jars or tumblers for keeping. (*Canning and Preserving, by Mrs. Rorer.*)

Sweetmeats.—Take Damson plums that are perfectly ripe, peel and divide, and take out the stones; put over a gentle heat to cook in their own juice; when

soft rub through a sieve and return to the stove, adding just enough sugar to sweeten, a little cinnamon, and, when nearly done, wine in quantity to suit the taste. This is done more to keep the sweetness than for the flavor, as self-sealing cans are not used here. All preserves are pasted up with the white of eggs. (Mrs. Williston, Heidelberg, Germany, in Buckeye Cookery.)

Spiced Plums.—Make a syrup, allowing one pound of sugar and one pint of vinegar to each seven pounds of plums; to this add one teaspoonful of allspice, one of cloves, two of cinnamon, one-half ounce of ginger root; tie these spices in muslin and cook in the syrup. When it boils add the plums, bringing all to the boiling-point; simmer slowly for fifteen minutes and stand in a cool place over night. Next drain the syrup from the plums and put the plums into stone or glass jars; then boil the syrup until quite thick and pour it over the fruit.

Another recommends pouring the boiling spiced syrup over the plums in a stone jar, drawing it off and bringing it to a boil every other day and pouring over the plums again until it has been heated five times, after which the fruit and syrup are placed in a kettle and boiled slowly for five minutes, and sealed hot in glass jars. This is said to preserve the plums whole.

By simply covering the fresh plums with cold well water, they may be kept for three weeks or longer, and the water removes all harshness from the skin and pit. They may be kept in good condition for use until winter or the following spring, by placing in a barrel or jar and pouring boiling water over them.

To Remove Fruit Stains.—Mix two teaspoonfuls of water and one of spirits of salt, and let the stained part lie in this for a minute, then rinse in cold water. Or wet the stain with hartshorn (ammonia).

Another way to remove fruit stains: Pour on boiling water and let stand a few minutes.

A HORTICULTURAL WIZARD.

LUTHER BURBANK.

H. E. VanDeman has the following interesting sketch of our famous hybridizer in a late issue of the *Rural New Yorker*. As one must see from this, **Luther Burbank** was a born horticulturist:

Luther Burbank, of Santa Rosa, Cal., began by originating the Burbank potato while he yet lived in Massachusetts, and millions of bushels of that choice variety have since been grown and marketed in many parts of the world. He came of horticultural stock on his mother's side, for she is of the Burpee family, which is represented at Philadelphia by one of the most eminent flower and vegetable experts in the world. She is past eighty-five years of age, and lives with her son in California, witnessing the results of his useful life. His father's family were of a mercantile and manufacturing turn of mind. Although born and reared on a large farm in Massachusetts, the boy Luther was sent, when eighteen years old, as an apprentice to the Ames Plow and Spade Works, at Worcester, to learn wood-turning and pattern-making. The love of nature and outdoor work, which came from his mother's blood, would not allow him to endure the confinement and dust of the shop; so after three years of it he bought a small farm near Lunenburg, Mass., and began experimenting with plant life. It was here that he grew the Burbank potato from seed.

He told me once that he loved to work with plants from childhood, and can remember a big crying spell he had over smashing a pot with a cactus plant in it when he was less than three years old. He soon became inspired with the idea of devoting his life to originating new fruits, flowers, and vegetables. Thinking the climate of New England uncongenial to this line of work, he moved to Santa Rosa, Cal., in the fall of 1875. He started a small nursery there, in which the olive was a specialty. When I visited him there in 1888, he had all his propagating houses full of olive plants. He was constantly experimenting with seedling fruits and flowers, and, although this work was not so profitable as the nursery business, he loved it better, and sold out all but the experimental part, that he might devote his whole time and means to it.

At his home within the city limits, he has about ten acres, all devoted to experiments, and a large modern greenhouse, in which some of his most delicate work is done. At Sebastopol, which is a few miles distant in the foot-hills, he has eighteen acres closely set to experimental trees and plants, besides about thirty acres for farm experiments. Mere curiosity or pleasure seekers are not admitted to his premises, for he has no time to devote to them, neither does he wish to give information outside until he is ready.

At one time there were on his grounds over 80,000 seedling lilies. Mr. Burbank originated a new strain of the gladiolus, of which he sent me ten of the choicest varieties about ten years ago. He sold out the whole lot to an Eastern nurseryman. Over one million seedlings were grown before he was satisfied to send out his stock. He grew thousands of seedlings of the iris, and also originated new varieties of the calla and rose that are decided improvements. The chestnut and walnut have received attention at his hands. Some of the most phe-

nomenal varieties of the chestnut ever known were originated by Mr. Burbank. The Persian walnut has been crossed upon the wild walnut of California, and various other crosses of the same nature were made in this family, which have resulted in some remarkable varieties. Among the berries, he has made crosses and grown millions of seedlings. He has repeatedly accomplished what was long thought to be impossible, in the crossing of the blackberry and raspberry, and even the strawberry and raspberry. The latter cross resulted in nothing of value, but the former has given us some very excellent varieties. Some of his quince seedlings are of the very highest character, and will, in due time, prove themselves so in culture.

He is making a new lot of crosses at blooming time, planting a new lot of seedlings every year. Not long since he wrote me that he had over 2700 new seedling plums fruiting this year. Of these but few, and possibly none, will be saved by him and sent out to the public. He requires several years' trial before allowing anything to be sent out, or even named. The consummate skill, the enduring patience and the immense expenditure of time and money necessary to accomplish what he does is rarely imagined and, perhaps, never fully appreciated.

Another writer has this to say of Luther Burbank:

He has made the plum a perfect thing. One of his creations was immediately bid for by a syndicate that offered \$10,000 for its control, but it was placed on general sale. Pieces of grafting wood of it were sold at the following prices for propagation: Two feet, \$15; five feet, \$30; fifty feet, \$200; one hundred feet, \$350. Dormant buds on peach and almond roots sold at \$10 each. When a customer questioned the price he said: "You do not appreciate the difference in value of two little pieces of living plum wood, one of which has the power of producing trees that will bear fruit worth \$855 a ton, while the other will bear fruit worth only \$5 a ton." Of another plum he said: "There is only a little bundle of the grafting wood in existence." (This fruit sold at \$8.50 for a box of twenty pounds, eighty-eight plums in the box—42¾ cents per pound, at wholesale.) In an announcement of new creations for 1900 he mentions a new hybrid plum of enormous size and flesh like a white, juicy peach. He is often called the "wizard of horticulture."

THE OPPORTUNITY FOR WIDER PLANTING.

By S. H. LINTON, Marceline, Mo.

That we may better understand the various varieties now in nursery catalogues, it is proper to give the origin, order and group of plums as laid down by scientific authority. The *domestica* or European types (*P. domestica*), native to western Asia, include all of the old-time plums, Green Gage, Bradshaw, Yellow Egg, Damson, Reine Claude. The Chickasaw types (*P. angustifolia* or *P. chicasa*), belonging to the Southern states (on a line with southern Delaware southward), are such varieties as Newman, Caddo Chief, and Lone Star. The American type (*P. americana*) is composed of the common wild plums of the northern part of the United States, from Michigan west to the Rocky mountains, thence south to the Gulf. The Wild Goose or *hortulana* types (*P. hortulana*) form the group of Wild Goose, Wayland, Moreman, Golden Beauty, and Miner; "no doubt hybrids of the native and Pacific coast plum." The Sand plum (*P. watsoni*), native to Kansas and adjoining states, is but little known or cared for by horticulturists. The Beach plum (*P. maritima*), native on the north and eastern Atlantic coast, has little value in fruit, but the trees are beautiful as ornaments. The Pacific coast plum (*P. subcordata*) is a natural product of the forests of Oregon and California, but little known in domestication except in the individual of the Sissin type.

Within the last decade has come the introduction of the Japanese type (*P. triflora*), "probably native of China," says Professor Bailey. During its brief stay the Japanese plum has made many warm horticultural friends, and generally adapted itself to the climate and soil in the United States in all territory south of the north line of Missouri, and will undoubtedly be of great value and a grand acquisition to the already large group of fine plums. By careful breeding, some choice varieties of the Japanese type can and will be produced that will withstand the severe winters of the more northern states. Prof. L. H. Bailey says: "I am still convinced that the Japanese plum has come to stay." Here in Missouri we can add to this, by saying that we are truly glad that they have come. With the addition of the Japanese plum the season is extended from June to the first and middle of September, and in some seasons even into October. . . .

The plum, being prolific in fruit, is necessarily a gross feeder and must have abundance of food combining the proper ration. The three elements in proper ratio which give both wood and fruit growth are: Nitrogen, two per cent.; available phosphoric acid, seven per cent.; potash, nine per cent. This fertilizer should be applied in quantities

of 500 to 1000 pounds per acre annually. The fundamental laws of systematic or scientific horticulture are based on proper food ration. The best soil for plums is a heavy clay, underlaid with a gravelly sub-soil, capable of conserving moisture. The color of the top soil needs little consideration in selecting a proper location for planting—more depending upon the proper chemical analysis of the soil, combined with complete drainage. Hillsides, points, and ridges—other advantages being favorable—make good locations for plum orchards; such locations are numerous in this state. We, as citizens of this great state of Missouri, know no limit or scarcely any bounds to the cultivation of the better and more profitable varieties of plums. "Of all the important fruits, the common plum has the smallest American literature," says Professor Bailey. This is as much as to say that the culture of the plum, of all fruits, is most neglected, and what is true in this case in the Eastern states is also a fact in Missouri.* Then our fruit-growers should wheel into line with their best and most direct financial interests and plant more good plums, which make a quick return in profit and greatly assist in bridging over the expense of planting and growing other fruits that take longer to produce a crop. Progressive horticulture, toned with experience, polished by science, the products reaped with the golden sickle of success, stored in the broad, liberal minds of the intelligent grower, the joy and pleasure divided with the family and subdivided with friends and acquaintances, is the theme sought for. . . .

CLASSIFICATION OF THE SEXUAL AFFINITIES OF *PRUNUS AMERICANA*.

By C. W. H. HEIDEMAN. Read before the Minnesota Academy of Natural Sciences.

THE PROBLEM.

The uncertainty of the regular annual fruiting of plums in the Northwest, where only the native *Prunus americana*, in its many varieties, has been found sufficiently hardy to endure the climatic conditions, has long been a difficult problem in horticulture. Writers on the subject of plum culture have attributed as the cause of the more or less non-productiveness "the influences of domestication and consequent high culture," "self-sterility," etc. The beneficial effect of cross-fertilization has been hinted at and proposed as the remedy for all cases of infecundity. Mixed and close planting of the varieties to better insure cross-fertilization has been suggested by nearly all of them. Reports of various horticultural societies are filled with

* We think this applies to Kansas as well.—Sec.

instances of the beneficial effect of cross-fertilization, but, reading between the lines, as many or more instances of the failure of good results from cross-fertilization have been recorded. Cross-fertilization, therefore, unless it be effected in the direction of the natural affinities of the varieties, does not completely explain why certain varieties, even with the aid of cross-pollination, may be prolific one season and the next produce no fruit at all; why one season the fruit will be large and fine, the next inferior in size and quality; why an unusually fine variety in the woods and thickets will be worthless when removed from its surroundings, even with subsequent best of care and culture.

About ten years ago I began making artificial crosses for the purpose of breeding improved varieties. My grounds contained at least 200 trees, mostly selected from the woods and thickets along the Minnesota and Cottonwood river bottoms, together with a few horticultural varieties of *P. americana*. I soon found that many of my desired crosses were difficult to obtain. I observed numerous adaptations to ensure cross-pollination, together with differences in morphology of the stamen and pistil. Crosses between certain forms were fully fertile, while with others negative results were invariably obtained. Reciprocal crosses between varieties and between species were not equally fertile. I determined to go into the matter systematically, keeping a careful record of each cross made and noting the result, raising hundreds of seedlings and again experimenting with them.

P. americana and other species of *Prunus* vary much in their wild state in flower, fruit, foliage, season of maturity, and other botanical characteristics, so much so that an enterprising botanist might easily pick up in the thickets of almost any natural area where they abound a dozen or more varieties with characters so distinct from the type as to entitle them to the distinction of specific varieties. The writer has no desire to inflict upon scientific botany any further division of the botanical characters of a species which is already sufficiently defined, but only offers his classification for the purposes of this paper in the interest of economic horticulture.

CLASSIFICATION.

Adopting the nomenclature used by Darwin in his "Different Forms of Flowers on Plants of the Same Species," and classifying as to morphology and function, we find the following fairly well-defined forms in addition to the hermaphrodite form of botanists:

Dichogamous Group.—Proterogynous, on which the stigma is ready for fertilization and has passed the receptive stage before the pollen matures. Proterandrous, on which the pollen ripens and matures before the stigma is ready for fertilization.

Heterostyled Group.—Long styled, on which the pistil is nearly twice the length of the stamens. Short styled, on which the stamens are nearly twice the length of the pistil.

Bisexual Group.—Gynodioecious, on which the flowers in morphology consist of perfect flowers, but mostly females with anthers aborted and only a few grains of pollen, and these smaller and mostly aborted. Andromonœcious, on which the flowers in morphology consist of perfect flowers, but mostly males with most of the pistils wanting or only present in a rudimentary form.

These divisions in morphology and function are generally well defined, but sometimes graduate into each other. The hermaphrodite form, which is the only one capable of self-fertilization, is now scarcely found in a wild state. Most of our cultivated varieties of *P. americana* are transition forms of this, and are somewhat difficult to classify. Some of the horticultural varieties certainly belong to the next, and a few are certainly heterostyled. Dichogamous varieties are more frequently met with in nature. The proterogynous form is easily distinguished by most of the pistils projecting through and above the petals, which for a day or two remain incurved over the still immature stamens, thus mechanically preventing the ripening of the pollen, and fertilization, if accomplished at all, has generally been effected before the petals expand. I have also noticed in intense forms of this and the next a considerable difference in the time in which the stigma became receptive and the pollen mature after exposure to air and sunshine. The proterandrous form is also easily distinguished from the fact that the pistil, before the petals expand, is found curved within the corolla, the stigma being inverted and partly within the calyx tube. About twenty-four to thirty-six hours after the petals expand, and usually after the pollen on the anthers has all dehisced, the pistil gradually assumes an upright position and becomes receptive; and as the stigma does not become receptive until after an exposure to the influence of light and air for at least an hour or two, self-fertilization is prevented. The peculiarities of the two dichogamous forms not only in a measure mechanically prevent self-fertilization, but certainly prevent the maturation of the pollen grains and stigmatic secretion at the same time, and this alone in the more intense forms is sufficient to prevent self-fertilization.

With respect to heterostyled plants Darwin says: "Unless it be proved that one form is fully fertile only when it is fertilized with pollen from another form, we have not complete evidence that the species is heterostyled. But when pistils and stamens differ in length in two or three sets of individuals, and this is accompanied by a difference in the size of the pollen grains, or in the state of the stigma,

we may infer with much safety that the species is heterostyled." If the above test is correct, then a few individuals of our species are heterostyled, and many more are tending in that direction. Bisexuality is clearly defined in many individuals in nature, the male form being more numerous. I have frequently met forms entirely devoid of pistils. Now and then I have found forms which do not appear to come under any division of the foregoing classification. For instance, I have a tree which for three years has produced flowers, each of which had two, and in a few instances three apparently perfectly developed pistils. So far no fruit has set, although I made last spring a number of hand crosses to determine its affinity. These freak forms are the exception, and with them this paper has nothing to do.

POLLINATION AND FERTILIZATION.

The fruit-buds of *P. americana* are developed on the spurs and spur-like branches of the current season's growth. The following spring, on approach of steady warm weather in May, the buds swell and expose from one to five flowers, in a simple, umbel-like cluster. The period of bloom and the time when pollination may be effected generally extends over two or three days, and in cool and cloudy weather it may extend over a week. Pollination is effected by the aid of wind or insects. Within from two to twenty-four hours after the blossom has fully expanded, or, in the dichogamous forms, after the pistil and stigma have been exposed to light and warmth, the stigma becomes receptive, as may be plainly seen with a glass of moderate diameters by the glistening secretion on the stigma. Pollen ripens, during clear, warm weather in about the same time, varying slightly in the different varieties. Within three or four days after fertilization has been effected the petals drop off, and the calyx tube is parted over the now slowly swelling ovary and drops off. When pollination has not been effected the blossom continues fresh for several days, although the stigma may have become covered with dust and withered and become non-receptive, and it finally drops off, the peduncle remaining for a day or so longer. The peduncle lengthens to nearly its full length from the time the blossom bursts from the bud until fertilization is complete, and when legitimately fertilized enlarges in diameter. When fertilization has been illegitimately effected the peduncle does not enlarge in diameter as much, and the slightly enlarged ovary usually falls, together with the peduncle, within from three to twenty days after fertilization.

The season of full bloom ranges in different varieties over a period of about ten days. The past season, my earliest-blooming varieties were in full bloom May 2, and the latest May 10. The actual time in the life of a blossom during which fertilization may be effected

scarcely exceeds two hours, and is not, as many suppose, during the whole life of the expanded flower.

LEGITIMATE AND ILLEGITIMATE FERTILIZATION.

From the many artificial crosses that I have made and recorded, I long ago became convinced that fertilization might be effected in different degrees, and that many plants had the power of throwing off such ovaries as were fertilized by pollen lacking in sexual affinity, and that this was especially true in *P. americana*. It should be borne in mind that the production of seed is the chief end of the act of fertilization, and the vivification of the ovule is the primary object of pollination. By systematic crossing and hybridizing, I determined that the union of the reproductive elements of two trees possessing the proper selective affinity for each other readily produced a stronger development of the ovary; a union of this kind I shall call "legitimate." It is well known that by crossing distinct species fertilization is effected with more or less difficulty; that reciprocal crosses of the same two species vary in the intensity of fertilization. As to the union of the reproductive elements of varieties lacking in sexual affinity for each other, or in which the reproductive elements have become too greatly differentiated and the development of the ovary either fails entirely or is below the normal, I shall use the term "illegitimate," and in the same sense as used by Mr. Darwin.

The simplest test to determine the sexual affinity of any variety, and one which I have never known to fail when under proper conditions, is to take several sets of flower clusters and pollinate each individual stigma with pollen of a different form. The union of such crosses as possess the proper degree of affinity will prove fertile, while the union of those lacking in affinity will prove sterile. No matter how many of the flowers of each cluster are pollinated legitimately or illegitimately, the result will be as above. If all of the flowers of a cluster are pollinated legitimately, they will all set fruit, barring accident, of course. This experiment may be modified by many different combinations. Of the forty-nine possible combinations, or directions, of pollinations, but one form, the hermaphrodite, is fully fertile with its own pollen. Including the hermaphrodite form, cross-fertilization is legitimate in only thirteen directions. Thus, it will be seen that, among the seven forms of *P. americana*, pollination is possible in forty-nine directions, thirty-six of them giving negative or illegitimate results, and that there are only thirteen directions in which cross-fertilization is possible.

I know of no group of plants more favorable than the genus *Prunus* for the study of the order of evolution from the hermaphrodite stage to the higher stage of bisexuality. Their organs of reproduction, as

I have shown, present a number of peculiarities of morphology and function, unusually interesting and significant and at the same time unusually intelligible, nor are these peculiarities exhibited to the same degree by any other group of plants. A study of these numerous adaptations to insure cross-fertilization must necessarily end in the conclusion that our species is gradually approaching a state of dioeciousness, and, fortunately for our discussion, there appears to be no missing link in the chain. With these numerous adaptations and structures to prevent self-fertilization and to insure cross-fertilization in view, we are prepared to understand why, in the several cases, self- and cross-fertilization are possible, and why impossible; why cross-fertilization is possible in a certain direction, while the reciprocal cross may be sterile; and, finally, by what means our species is gradually becoming dioecious.

The wedge of variation, having gained a hold of our hermaphrodite form, still in existence and capable of self-fertilization, and forced by long-continued self- and occasional cross-fertilization, produced the earliest types of our dichogamous group which the better insured cross-fertilization. In the proterogynous form, the pistil, protruding through the still undeveloped petals and stamens and receiving the advantage of sunlight, air, and warmth, was encouraged to greater development, the stamens being correspondingly retarded. In the proterandrous form, the stamens received the benefit and the pistil was retarded. Through successive generations, the influence of the law of balancement has been at work, the evolution towards a separation of the sexual organs has fairly started, and we have the foundation in the proterandrous and proterogynous forms for the pistillate and staminate forms of a future dioecious species. Simultaneously with the development of the pistil and retardation of the stamens, and *vice versa*, came the further adaptation of difference in time of maturity of the reproductive elements, with an additional protection against self-fertilization.

The development of the reproductive organs, aided by the law of balancement, continued, and we have developed the heterostyled group. What we before accomplished to quite an extent by purely mechanical adaptations is now accomplished by a differentiation in the reproductive elements. So great a differentiation in the reproductive organs surely caused a differentiation in the sexual elements. Our species has now become divided against itself. The differentiation of the reproductive elements was followed by still further development and retardation of the reproductive organs, and we have nearly reached the bisexual stage, not only in morphology but in function.

We now have only a step further to the complete separation of the

sexual organs. In the earlier stages of the dichogamous group self-fertilization was possible, but mainly prevented by mechanical adaptations to insure cross-fertilization. In the heterostyled group, self-fertilization is prevented by the great differentiation in the reproductive elements, and the sexual affinity destroyed. There can be no doubt that the differentiation into species was accomplished by variation of form, foliage, cell structure, etc., without a corresponding differentiation of the sexual elements. We know this from the fact that distinct species will sometimes cross, but not freely, in a reciprocal direction.

I have myself, within the past ten years, produced hybrids between *P. angustifolia* and *P. americana*; between *P. domestica* and *P. americana*; between *P. besseyi* Bailey (*P. pumila* Lin.) and *P. hortulana* B.; between *Cerasus avium* var. and *P. besseyi* B. I made several hundred crosses to produce hybrids between our Sand cherry (*P. besseyi*) and horticultural varieties of *Cerasus avium*. Pollen of *C. avium* var. on *P. besseyi* invariably proved sterile; reciprocal crosses set fruit, but they failed to germinate, the seed containing only a trace of the aborted ovule. When I finally used the pollen of a proterandrous form of *P. besseyi* on a short-styled form of *C. avium* fertilization was effected and developed a normal fruit, the seed of which germinated and produced an undoubted hybrid. The reciprocal crosses of the same varieties failed to fertilize a single ovule out of over fifty crosses made. I had applied the same principle in the production of hybrids between *P. hortulana* and *P. besseyi* with fair success. The successful crosses just mentioned were made with pollen which had not been too greatly differentiated, on a pistil which, in accordance with the theory advanced for the evolution of the different forms, had been retarded. The unsuccessful crosses were made with differentiated pollen on a pistil not sufficiently differentiated.

Finally, we must conclude that the means by which the bisexual forms have been produced, though gradually and necessarily very slow, are identical with the forces that produced the different species. In the crossing of the different species, we find that, by applying the same rule for cross-fertilization, we can trace the genealogy back to the forms wherein the differentiation of the sexual elements had not destroyed their affinity. From these experiments we deduce the following:

CONCLUSIONS.

Self-sterility of *P. americana* in the heterostyled and bisexual forms is caused by the great differentiation of the sexual elements. Pollination by wind and insects cannot be controlled to any extent. Mixed planting, therefore, unless it be done with respect to the nat-



ural affinities of the varieties, may produce the most disastrous result for the horticulturist.

Other species of *Prunus* observed show these characteristics of *P. americana*, and it may be possible to bring them together under a similar classification.

Finally, we have gained some knowledge in the summary production of hybrids.

THE JAPANESE PLUMS IN NORTH AMERICA.

By PROF. L. H. BAILEY, Cornell University, Ithaca, N. Y.

In 1870 Mr. Hough, of Vacaville, Cal., secured several plum trees from Japan through Mr. Bridges, a United States consul in that country, at a cost of ten dollars each. These trees soon passed into the hands of the late John Kelsey, of Berkeley, Cal., who obtained the first ripe fruit in 1876 or 1877. Mr. Kelsey became convinced of the value of the plum for general cultivation, and its propagation upon an extensive scale was begun in 1883 by W. P. Hammond & Co., of Oakland, who afterwards named it in memory of Mr. Kelsey, and who made large sales in the planting season of 1884. Subsequently other parties, particularly Luther Burbank, of Santa Rosa, Cal., made importations of plum trees from Japan, and have disseminated the varieties widely. For the past four or five years these plums have awakened more interest throughout the country than any other new or recent type of fruits; and it has been found, contrary to the early opinion, that many of them are adapted to the Northern states. While they are often inferior in quality to the best garden or Domestic* plums, they possess various desirable characteristics which the others do not, particularly great vigor and productiveness of tree, comparative freedom from disease, great beauty, and long-keeping qualities; and the best of them compare well in quality with the common plums.

For many years after the introduction of the Kelsey, there seems to have been little speculation as to the origin or botanical position of these oriental plums; but as the varieties increased and began to attract general attention, a demand arose for a knowledge of their genesis. A plum found in the botanic gardens at Calcutta about seventy years ago by Roxburgh, and by him named *P. triflora*, seemed the most likely parent; but as there were some difficulties in his characteriza-

*The term Domestic plums is used to distinguish the common cultivated plums, all of which have sprung from the European *P. domestica*, from the native and Japanese types. The term Japanese plum is used only for these varieties of *P. triflora* now under consideration, and does not include the Bongo or Bongoume types, which are apricots.

tion of the species, and as subsequent botanists have not found the wild form, and as Maximowicz, the most eminent botanist who has recently given careful attention to these oriental floras, does not identify the cultivated plum flora of Japan with Roxburgh's species, I accepted for a time a name proposed by Professor Kizo Tamari, of Tokio, *P. hattan*, and published it as the best means of classifying our knowledge of these plums until the proper botanical name should be determined. In 1891 Professor Georgeson, of the Kansas Agricultural College, who had spent some years in Japan in a critical study of its products, definitely referred these plums to *P. triflora*, of Roxburgh, in an article in *American Garden*.*

The types in cultivation vary much amongst themselves, but I have been unable to make more than one species out of them, and the variation is considerably less than in the families or groups of the *domestica* plums, which botanists are pretty well agreed have descended from a single specific type.

This plum is probably native to China. Roxburgh said that the species was introduced in Calcutta from China, and, upon this assertion, Hemsley admits it to his recent "Flora of China," having "only seen specimens cultivated in the Calcutta botanic garden." There is no record, so far as I know, of its occurrence in a native state in Japan. Professor Georgeson remarks that its cultivation is old in Japan and that its origin is uncertain; and Professor Sargent, of Harvard University, who has recently made an exploration of the forests of Japan,

* The following is Roxburgh's description of the species in his "Flora of India," p. 501 (in this work the plant is called *P. trifolia*, probably through inadvertence): "Unarmed, peduncles tern; leaves oblong, very finely gland-serrate, smooth, in the bud equitant; drupes cordate. China, Hong-sum-li. This elegant, very ramous, bushy shrub has been received from China into our gardens in Bengal, where it blossoms in February, immediately after which the luxurious foliage expands, and the fruit, which is about the size of the common plum, and nearly as palatable, ripens in May and June. Trunk in our young cultivated trees, or rather shrubs, very short, soon dividing into numerous branches and branchlets in all directions from diverging to erect. Bark on all smooth. Leaves alternate in the bud equitant, petioled, recurved, oblong, tapering equally at each end, very finely gland-serrate, considerably acuminate, smooth, from two to four inches long and from one to two broad, in Bengal deciduous about the close of the year. Stipules from the base of the petioles, ensiform, gland-ciliate. Flowers very numerous, rather small and white, short peduncled, regularly three from each bud, and there are generally two of those buds in each of the old axils, with a leaf-bearing one in the center. Bractes, the scales of the bud, cordate, scariosse, and nearly caducous. Calyx, segments five, oblong; margins glandular. Petals oval, short clawed, the length of the peduncles. Filaments about thirty, shorter than the petals. Germ ovate, one-celled, containing two ovula attached to the same side of the cell. Style the length of the stamina. Stigma large. Drupe cordate, with an obtuse rising at the apex, the size of the common plum, and of the same purple color, covered with a similar bloom, grooved on one side. Pulp in large quantity, of a pale, reddish yellow. Seed single, conform to the nut. Integument single. Perisperm a thin covering on one side only. Embryo inverse. Cotyledons unequal, the small one doubled, and embraced by the larger, subequitant."

was unable to find wild plants. Much of the interior and western portion of China is unexplored botanically, and it is not strange that the aboriginal type of this interesting fruit is yet undiscovered. According to Bretschneider, the plum was anciently cultivated in China, which indicates an indigenous origin.

Maximowicz, Hemsley and other botanists seem to be confused with the resemblance of *P. triflora* to *P. domestica*, and it has also been said by various pomologists that some of the plums recently imported from Japan are only varieties of the *Domestica* type. While botanical specimens of the two may strongly resemble one another, the species are nevertheless readily distinguished, even in winter, and I have not yet seen a plum of Japanese origin which can be referred to *P. domestica*. In fact, the *Domestica* plums seem to be little known in Japan. Professor Georgeson, writing upon this point, makes the following statements: "The varieties of this species, which is our common plum, have been introduced in Japan, but are not generally known, if known at all, beyond the environments of foreign settlements and those regions reached by the Kaitakushi in its attempts to introduce and naturalize foreign fruits. The Kaitakushi was the name of a department of the government (commonly translated colonization department), which, however, was abolished long ago. Its object was to colonize the northern island with Japanese, and to this end large numbers of fruits and other economic plants from the West were introduced, the climate there being somewhat like that of central and northern Europe." If the *Domestica* plums are little known in Japan, it may also be said that the Japanese plums appear to be wholly unknown in Europe,* unless possibly in Russia, and it is therefore not probable that any serious confusion of varieties has occurred between the two species. It is very important, then, that a complete record of this species should be made while yet it is confined to comparatively isolated areas of the globe.

Botanical position of the Japanese plums.—There is a striking difference in the winter characters of trees of Japanese and *Domestica* plums. The Japanese varieties tend to make long and forking branches, with a light-colored, rough, somewhat peach-like bark, which is marked by numerous corky elevations, while the *Domestica* are closer and more bushy growers, with a dull gray or purplish, tight, smooth bark. But the greatest differences lie in the buds. For example, Coe's Golden Drop, a *Domestica* plum, in common with all varieties of the species, has single and pointed buds. The Japa-

*Naudin, for instance, in his admirable "Manual de l'Acclimateur" (1887), knows the species (which he calls, erroneously, *P. japonica*) only from an account of the recent introductions into California contained in the *Gardener's Chronicle*.

nese varieties usually have their buds in threes, as in the Burbank, or sometimes even in fours or fives, as in the Kerr, and these buds are small and blunt. Three flowers commonly spring from each flower-bud of the Japanese varieties, and it was this circumstance which led Roxburgh to call the species *P. triflora*, or three-flowered plum; while in the *Domestica* type the flowers are more commonly one or two from each bud. The buds are often aggregated upon short spurs in the Japanese varieties, and the flowers are then crowded into showy masses, as in the Ogon. Upon the longer shoots, where the buds are but three at a joint, the clusters are less evident, as in the Kelsey, yet their glomerate character is always more marked than in the *Domesticas*. Brief characters of separation may be drawn between *P. domestica* and *P. triflora*, as follows:

Common Plums (*P. domestica*): Trees of moderate and more or less crooked growth, with not roughened gray or purplish and often pubescent young wood and single, pointed buds and large, protruding leaf-scars; flowers usually one to two from a bud, large and opening wide, mostly long-stalked; leaves mostly large, thick and heavy in texture and prominently netted and often pubescent below, dull above, varying from ovate to round-ovate to broadly obovate in outline, blunt or the point not pronounced, conspicuously obtusely toothed or sometimes almost jagged; fruit globular or oblong or even oboval but not prominently pointed, with a large, flat, pointed and winged pit.

Japanese Plums (*P. triflora*): Trees of strong growth, with widely spreading, long, forked branches, which are light colored and marked with corky elevations, the young growth not pubescent, the buds three or more at the joint, and the leaf-scars often small; flowers mostly two to three from each bud, generally rather small and short-stalked, and sometimes not opening wide; leaves firm but rather thin in feeling and not pubescent nor rough-netted below, although the whitish veins are pronounced, very smooth and often somewhat shiny above, commonly long-obovate or sometimes nearly elliptic in outline and the point usually prominent, the edges marked with fine, close serratures; fruit globular or more often conical, and with a deep depression at base and a very prominent suture, the flesh clinging to or free from the smooth or lightly pitted, scarcely winged pit.

But these Japanese plums are more nearly allied botanically to our native plums, particularly to the Wild Goose type, than they are to the *Domestica* class. This may be seen even in the twigs of the Wild Goose. And this similarity to our native species is really, to my mind, one of the strongest points in their favor, for it indicates that they will be likely to adapt themselves to a very wide range of our great country, inasmuch as we may fairly assume that similarity of

attributes has been produced by similarity of environment. This conviction of their kinship with our native species and the knowledge that they come from the eastern Asian region from which we draw so many of our adaptive plants, has led me to recommend them strongly for trial even in our more trying fruit regions; and recent reports indicate that some varieties bear so far north as Ottawa, Ontario, and in the trying winters of central Iowa; and one, at least, of Professor Budd's Russian plums is of this species. Several pomologists have been struck with this similarity of the Japanese and native types; and, strangely enough, Dr. A. B. Dennis, of Cedar Rapids, Iowa, in endeavoring to explain this relationship, in a recent paper before his state horticultural society, by supposing a former land connection between northwestern America and Asia, has independently hit upon one of the important points in the coincident evolution of the Japanese and eastern American floras, the discussion of which, over thirty years ago, made Asa Gray famous.

It may be well, in passing, to consider for a moment the possible effect of this new class of plums upon the further development of our native species. I am sorry to hear from some of my friends who have given careful attention to the amelioration of the natives, that they shall now relax their efforts upon the native types and accept the Japanese sorts in their stead. It is true that the Japanese plums are now better in their fruit, for all that we can see, than the natives, but we can depend upon it that they will develop weak points somewhere, even in comparison with the little-improved natives; and we should further consider that all types of plums now in the country, or likely to come in, add variety and diversity to the foundation upon which our horticulture must build, and make it possible to develop fruits for every variety of country and use. And if the Japanese plum promises more for large areas of our country than the European or *Domestica* type, because of its evolution in conditions somewhat like our own, certainly the native species must possess still greater promise. The native species are yet scarcely rescued from the woods, while the other two have been cultivated for centuries; but, while the latter have sprung from a single species in their respective countries, our native stock offers at least a half-dozen species, and it is from them, without a doubt, that the greater part of the American plum industry will some day be found to have sprung.

Nomenclature and classification of varieties.—There is much confusion in the nomenclature of the Japanese plums. If the varieties imported from Japan have been named at all, they have usually come as Botan or Botankio, Hattankio or Sumomo (generally written Smomo); but these names refer to classes or groups of varieties, and

the attempt in this country to apply them definitely has resulted in confusion. It may also be said that the Satsuma or blood class appears to comprise several varieties. The Sumomo class is characterized by small, globular fruit, with a firm, sweet flesh, ripening very early. The Botans or Botankios are larger and later round plums, while the Hattans or Hattankios are conical. The terms are applied loosely even in Japan, and it does not seem to be worth while to endeavor to retain them here, particularly as there appear to be all manner of gradations between the types of the different groups. There has been some misconception of the application of these terms, and it is often said that they refer to color rather than to shape.*

There are various colors in each of these classes of plums, from deep purple to light red, yellow, and nearly white. The Hattankio class seems to be the commonest in this country, being represented by the Kelsey, Burbank, Satsuma, Abundance, Berckmans, Normand, Kerr. The Botans are represented here chiefly by Ogon and Willard, while the Sumomos seem to be known only in the little, cherry-like Berger, which passes under a variety of names. The Japanese plums might be divided into two general groups upon the color of the flesh—the yellow-fleshed and the red-fleshed, or Satsumas—but this classification would serve little purpose, although the Satsumas seem to be recognized as a class by my Japanese correspondents.

Characteristics of the Japanese plums.—Many varieties of Japanese are now named and more or less disseminated in this county, and others are known by numbers or indefinite appellations. . . . Un-

* Upon this point, Professor Georgeson explains as follows: "Quite a number of the many other varieties [than the Sumomo] springing from this species are designated by two general names, a fact which is very confusing to a stranger when he begins to study them. These names are botankio and hattankio, or bodankio and hadankio, for they are variously pronounced as regards the sound of *d* and *t*. These two names are common, and are even occasionally heard in this country; but it is a mistake to suppose that they apply to two and only two varieties. They are names of two ill-defined classes of plums, and are applied rather loosely to several varieties which differ in color and size, and somewhat also in shape. The only distinction between the two classes that I have been able to establish is based on the shape. The round plums are designated by the term botankio, while those of an oval or pointed shape are called hattankio. A mistake often made by foreigners, and by some natives also, is to suppose that the distinction is based on color, though it is a fact that most of the botankios are red. The name hattankio is also sometimes given to the almond, while botan is the name of the peony, and ha-botan means cabbage, and one of the many meanings of kio, or kiyo, is large, or great. If these objects had anything to do with the naming of the plums, it seems probable that botan referred to the rounded shape and not to the color, since their peonies are found in a great variety of colors, and that hattankio referred to the resemblance in shape to the almond. But, as already remarked, these names are used very loosely, as it is an easy matter to find several evidently quite distinct varieties of each class for which both grower and dealer can give you no other name than botankio or hattankio, as the case may be. Sometimes, again, these terms may have a prefix indicative of color or size, or the place where it is grown." (Am. Gard., xii, 74.)

named seedlings are coming to be known to experimenters, and the time must be near at hand when a varied American progeny will come. . . . Unfortunately, the Kelsey was the first Japanese plum to become known in this country, and, as it is hardy only upon the Pacific coast and south of Virginia, it became a general impression that the species is not adapted to cultivation in the north. The varieties which are now known to be hardy in the plum regions of New York and Connecticut are Burbank, Abundance, Willard, Ogon, Satsuma, Berger, Chabot, and Yosebe, and most others give promise of hardiness. Doctor Dennis reports Burbank and Ogon to have borne at Cedar Rapids, Iowa, after having experienced a temperature twenty-six degrees below zero. Early blooming will probably prove to be a more serious weakness of these plums than lack of hardiness.

The season of these plums varies considerable. The earliest to mature in central New York is the little Berger, which ripens the middle of July. The earliest of what may be called the market varieties, in this latitude, seems to be Willard, which colors sufficiently for market about the 15th of July in ordinary seasons, and which is fully ripe for eating a week later. Ogon follows, coming in about the 1st of August, or sometimes late in July, or about ten days ahead of Wild Goose. Late in August, or very early in September, the Abundance is ready. Burbank ripens here about the first or second week in September.

As a class, the Japanese plums are long keepers. Even when fully colored and grown and fit to eat, some varieties will keep nearly two weeks, most will keep a week, and some, if not all of the varieties, ripen up well if picked rather green, after the manner of a pear, although they may suffer in quality from such treatment. Willard, picked when beginning to color on the exposed side, I have kept nine days in good condition in a warm room with no attempt to preserve them; Abundance picked August 24, when well colored, began to decay September 2; Burbanks, partly colored and picked August 24, were placed in a tight box in a warm room, and on September 5 they were nearly all in perfect condition and had colored well, but even then were not fully ripe; a red plum, much like Berckmans, kept from September 18 to October 1. J. H. Hale, of Connecticut, reports keeping Satsuma two weeks in his office in good condition, and they were fairly ripe when picked.

Varieties.—An attempt will now be made to describe the varieties of Japanese plums which are known in North America. The nomenclature is so much confused and many of the varieties so imperfectly known, that I cannot hope to have arrived at just conclusions in regard to the proper names and descriptions of all of them; but the

attempt will serve to classify and fix our knowledge of the varieties, and I hope that it will lead others to make a more prolonged study of them. It is particularly difficult to determine which is the proper type of any variety in those cases in which two or three fruits pass under the same name, and I presume that some of the following names may be found to be wrongly applied. On the other hand, it is very probable that some of the varieties which are here kept distinct may prove to be identical. Some of the varieties I know only from printed descriptions, but I have added them for the purpose of making the monograph complete. Many growers have given me great aid in the preparation of this descriptive list, among whom I should mention P. J. Berckmans, of Augusta, Ga., and S. D. Willard, Geneva, N. Y., without whose cooperation I could scarcely have attempted this essay.

It has seemed best to discard entirely the Japanese class names, as Botan, Botankio, Hattankio, Sumomo, and the like, as they only lead to confusion. I have therefore renamed some of the varieties which are passing under indefinite names or numbers. The introduction of the name Abundance for the plum first known as Yellow-fleshed Botan has been severely criticized in some quarters, but I have always felt that the renaming was not only justifiable but essential to lucid nomenclature. If the other Japanese generic names had been supplanted several years ago, much of the present confusion would have been avoided.

In rating the size of the varieties, Kelsey, of course, must stand ten; and in comparison with this standard even seven or eight represents a large plum.

It does not seem to be necessary to adopt any classification of these plums, and I have therefore listed them alphabetically. The most serviceable classification would be one founded upon color of skin and flesh. The varieties might be arranged as follows:

A.—Yellow-skinned plums: Georgeson, Kerr, Normand, Ogon.

B.—Red-skinned plums: (1) *Yellow flesh*.—Abundance, Babcock, Bailey, Berckmans, Berger, Burbank, Chabot, Kelsey, Long Fruit, Maru, Munson, Orient, Perfection, Red Negate, Strawberry, Willard, Yosebe. (2) *Red flesh*.—Delaware, Hale, Heikes, Late Blood, Satsuma, Uchi-Beni.

ABUNDANCE (Yellow-fleshed Botan). Medium in size (but large when thinned), varying from nearly spherical to distinctly sharp-pointed, the point often oblique; ground color rich yellow, overlaid on the sunny side with dots and splashes of red, in some specimens nearly uniformly blush-red on the exposed side; flesh deep yellow, juicy and sweet, of good quality when well ripened; cling. A strong-growing upright tree, with rather narrow leaves, and a decided tendency to overbear. This is the best known of all Japanese plums in the North, and its

popularity is deserved. Ripe in early September or late August. Imported by Luther Burbank in 1884. Named Abundance, and put upon the general market by J. T. Lovett in 1888. The fruit is apt to rot badly in wet seasons, unless well thinned.

BABCOCK (Botankio, Botan of some). Medium to large ($1\frac{1}{2}$ to $1\frac{3}{4}$ in. diam.), round, conical; skin yellow overlaid with purplish red, rather thick; flesh deep orange and solid, a little coarse, sweet, of good flavor and quality; cling; rather late, ripening about with the Burbank. Imported in 1885 by Luther Burbank. Now named for Col. E. F. Babcock, a well-known nurseryman of Little Rock, Ark., among the first to grow and recommend.

BAILEY. Large, nearly globular; ground color rich orange, overspread with light and bright cherry-red, and showing many minute orange dots; flesh thick and melting, yellow, of excellent quality; cling. Tree strong and upright, productive. Closely related to Burbank, but rounder and mostly larger, and a week or more later. Imported by J. L. Normand, Marksville, La., and by him named and introduced in 1891.

BERCKMANS (True Sweet Botan, Sweet Botan, White-fleshed Botan, Botan of some). Medium (slightly above if thinned), broadly and obtusely conical and somewhat angular in cross-section; deep blood-red if ripened in the sun; flesh very sweet, moderately juicy, excellent in quality; cling or semicling; ripens with Abundance or just ahead of it. One of the best. Introduced by Luther Burbank in 1887, from imported stock. The variety does not appear to be a true Botan, and its nomenclature is so confused and indefinite that I have renamed it for Mr. Berckmans, who has done much to popularize it.

BERGER. Fruit very small and globular; bright, uniform red; with a firm, meaty and sweet yellow flesh, and a very small, free stone, ripening as early as the middle of July in some parts of New York and Connecticut. The fruit is very distinct in appearance, and cannot be mistaken for any other Japanese plum which I have seen. T. V. Munson, of Texas, writes as follows of it: "The Berger plum is an upright, cherry-like tree. It bears a purple fruit about the size of the Black Tartarian cherry, with meaty flesh, nearly free stone, which is as small as the pit of the common Black Morello cherry, and much the same shape." Mr. Berckmans says that the "tree is very vigorous and distinct in growth, but a shy bearer. The fruit is too small to be worthy of being retained." What I have seen of this fruit, however, leads me to believe that it may be a useful sort for the home garden because of its earliness, daintiness, and pleasing flavor. Professor Georgeson, to whom I have submitted specimens, pronounces it a Sumomo.

BURBANK. Medium to rather large upon thinned trees, roundish conical form, the point generally blunt; ground color orange-yellow, mostly rather thinly overlaid with red, and showing many yellow dots, often more or less marbled, in the sun becoming rather dense red; flesh firm and meaty, yellow, rich, and sugary; cling. Strongly resembles Abundance both in fruit and tree, but the fruit averages larger and of better quality, rather handsomer in its varied markings, and is from two to four weeks later; exceedingly productive. One of the best of the Japans. Imported by Luther Burbank, Santa Rosa, Cal., late in 1885, and named for him by H. E. Van Deman.

CHABOT. Medium to large, oblong, conical; pink-red in color, with many very fine gold dots; flesh yellow and juicy, rather acid, of good quality; cling; medium to late in season; very productive. Ripe in this latitude early in Sep-

tember. Imported from Japan by Mr. Chabot, of Berkeley, Cal., but introduced to the trade by Luther Burbank in 1886. Especially valuable for drying.

DELAWARE. Roundish conical, medium in size; purplish bronze in color, with a white bloom; flesh wine color, juicy, combining many flavors. Trees semi-dwarf; very productive. Catalogued among Luther Burbank's novelties, 1893. Said to be a cross of Satsuma and Kelsey.

The following record of the actual dates of blooming of the Japanese plums has been prepared for me by J. W. Kerr, of the Chesapeake peninsula. It will be seen that some of them bloom as early as *P. pissardii* and *P. simonii*, which are known as very early bloomers.

Record of dates at which oriental plums bloomed at Eastern Shore nurseries, Denton, Caroline county, Maryland, 1892.

VARIETY.	Date when first open blossom appeared.	Date when half of buds were open.	Date when all or nearly all were out.
Kelsey	April 7	April 15	April 20
Botan	" 6	" 12	" 18
Ogon	" 16	" 18	" 24
Maru	" 8	" 16	" 22
Chabot	" 8	" 15	" 19
Botankio	" 4	" 8	" 10
Hattankio	" 10	" 15	" 19
Yosebe	" 16	" 18	" 24
Uchi-Beni	" 16	" 18	" 20
Shiro Smomo	" 14	" 16	" 19
Long Fruit	" 16	" 18	" 20
Yellow Japan	" 16	" 18	" 20
Burbank	" 7	" 11	" 16
Satsuma	" 7	" 10	" 17
Engre	" 15	" 17	" 20
<i>P. pissardii</i>	" 7	" 9	" 14
<i>P. simonii</i>	" 5	" 9	" 14

Some, at least, of the Japanese plums are much subject to fruit-rot, and this appears to be specially true of the Abundance, particularly when it is not well thinned. Mr. Kerr writes me under date of July 5, 1892, that "there is not a single variety of the Japanese plums that is holding its fruit except Botan, and even they are rotting very rapidly, and I doubt if a perfect specimen will go through. Bordeaux mixture seems to avail nothing as a remedy for the rot. Notwithstanding failures in general this year, I have begun shipping Chickasaws, of which I have a good crop." These plums are evidently not more subject to rot than many varieties of Domesticas, however, and I doubt if they are so much injured, as a rule, as the Lombard.

It has been said that these plums, or some of them, are curculio proof; but this is an error. Yet they often appear to escape much of the excessive injury which falls to the Domesticas varieties. The following note from the *Rural New Yorker* bears upon this point. I

saw the tree here described, upon the editor's grounds, just before the fruit was ripe, and it appeared to be free from curculio injury.

The Abundance plum (August 4) at the Rural grounds is a sight to behold. The branches are wreaths of fruit, and they, as well as the tree itself, are held up by props and ropes. Some of the plums are beginning to color; all are of good size, and, though the old marks of the curculio sting are engraved upon most of them, no injury seems as yet to have resulted. For twenty years, off and on, the *Rural New Yorker* has tried so-called curculio-proof plums. We have never used insecticides nor jarred the trees to destroy them, and we have never before had a crop of plums. Plums are not raised in the vicinity, simply because the people are not willing to put themselves to the trouble of jarring the trees, and they know from experience that they cannot raise plums without doing so. Now, here we have the Abundance loaded down with beautiful fruit, while not a precaution has been taken to destroy the curculio. Blessed be the Abundance! It is well named.

So far as I have been able to learn, none of the varieties are seriously attacked by black-knot, although the disease occurs on them. This circumstance, however, should not be dwelt upon too strongly, for it is possible that the exemption is largely accidental. Yet I have seen perfectly healthy trees on the Hudson river where all the common plums in the neighborhood were seriously injured. The varieties appear to be nearly exempt from leaf-blight, also.

The Japanese plums are commonly budded upon the peach, and so far very few complaints have reached me from failure of the union; but I shall be surprised if as strong and permanent results come from the use of this stock as from the use of their own seedlings or *Domestica* stocks.

REVIEW.

1. Twenty-four years ago a plum was introduced into California from Japan which proved to belong to a species heretofore unknown in America. It was first fruited by the late John Kelsey, of Berkeley, Cal., and for him it was named. It began to attract wide attention about ten years ago.

2. This plum belongs to the species *P. triflora*, which is supposed to be native to China, but which is unknown in a wild state. Subsequent importations have been made from Japan, and at the present time about thirty varieties are more or less known and disseminated.

3. These Japanese plums are distinguished from the common *Domestica* plums by their generally more-pointed or heart-shaped fruit, which has a deep groove or suture upon one side, by a longer-keeping flesh, and generally a less-winged pit. In other botanical features they differ, in commonly bearing three or more winter buds at a joint, instead of one, in the light-colored rough bark, flowers usually in twos or threes, leaves long-obovate or elliptic and finely serrate. They are closely allied in botanical characters to some types of native plums.

4. The nomenclature of the varieties is much confused, largely because the Japanese names are used for groups or classes and not for specific varieties; and there is no uniformity even in the generic application of these names. It is essential to an exact understanding of this fruit, therefore, that the Japanese class names be discarded in this country.

5. While importations from Japan have been made freely, there are probably many more good varieties in that country which have not reached America; but we must look for most permanent progress in the future from American offspring.

6. The Japanese plums differ amongst themselves greatly in hardiness. The Kelsey is adapted only to the states south of Virginia and to the warmer parts of the Pacific coast, but other varieties are fully hardy in parts of Connecticut, Ontario, New York, and Iowa.

7. The varieties now known to be hardy in the plum regions of New York are Burbank, Abundance, Willard, Ogon, Satsuma, Chabot, Yosebe, and Berger; and others give promise of being as hardy as these.

8. The period of ripening of the various kinds extends over a long season, running, in New York, from the middle of July to the middle of September. The same variety does not always appear to ripen at the same period in successive years. This is especially true of the Kelsey, which sometimes varies through a period of three months. In New York, the earliest market variety which has been tested appears to be Willard, followed closely by Ogon, then Abundance and Berckmans, and Burbank still later. Kelsey is generally the latest of all the varieties.

9. Most of the Japanese plums keep for several days, and some of them even for two weeks, after they are ripe. Satsuma is one of the best keepers known in the North.

10. The larger part of the varieties are red with deep yellow flesh, and the Satsuma, and a few varieties less known, have deep red flesh. There are only four well-known yellow varieties. There are eight freestones, as follows: Ogon, Willard, Kelsey, Berger, Maru, Munson, Normand, Yosebe.

11. The varieties which can be most confidently recommended at the present time are Abundance, Burbank, Willard, Kerr, Berckmans, Maru, Red Negate, Chabot, Satsuma, and, perhaps, Ogon. Kelsey is recommended for the South.

12. The chief weaknesses of the Japanese plums are too early bloom of some varieties and liability to the fruit-rot fungus. Amongst their advantages are partial immunity from black-knot and leaf-blight, and often a partial freedom from curculio injury.

13. Altogether, the Japanese plums constitute the most important type of fruit introduced into North America during the last quarter of a century, and they should receive careful tests in all parts of the country.

THE PLUM IN THE WEST.

From Bulletin No. 50, Colorado Experiment Station.

The genus *Prunus*, as now constituted, embraces those species from which have been developed all our stone fruits—almonds, peaches, nectarines, apricots, plums, and cherries. Its representatives are widely distributed over the earth, and the number of species given by different authors varies greatly. Bentham and Hooker, in their "Genera Plantarum," place the number at about eighty. A later work, the "Index Kewensis," recognizes 121 species, and records 290 names as synonyms. The 121 species here considered valid are distributed as follows: Eastern hemisphere, 87 species, 15 of which are credited to Japan and 12 to China; western hemisphere, 32 species, 21 of which belong to the United States and the region north; 7 are credited to Mexico, and 4 to South America and the West Indies; 2 species are recorded of unknown origin.

Our American manuals record species of the genus as follows: "Botany of California" (1876), 6 species; Chapman's "Flora of the Southern States" (1883), 7 species; Coulter's "Manual of the Rocky Mountain Region" (1885), 5 species, 1 variety; Gray's "Manual," sixth edition (1890), 10 species, 1 introduced variety; Coulter's "Flora of Texas" (1891), 8 species; "The Britton and Brown Flora" (1897), 16 native, 4 introduced species, 2 native and 1 introduced varieties. Taken together, these floras recognize 27 native and 4 introduced species, and 3 native and 1 introduced varieties.

Of the native representatives of the genus, sixteen species and one variety are true plums, or of such close affinity as to readily class with them, while eleven species and two varieties are cherries or belong with the cherry group. Nearly all the species enumerated in the manuals are, or have been at some time, introduced into gardens and cultivated, either for their fruits or as ornamentals, but the varieties now catalogued by nurserymen and grown in orchards represent but few species. Of the native cherries, only the shrubby Sand cherries (*P. pumila*, *P. besseyi*, and *P. cuneata*) are grown for fruit. The wild Red cherry (*P. pennsylvanica*) is occasionally used as a stock upon which the common sour cherries of European origin are grafted; it has also been used to a limited extent as a stock for some of the plums.

Of the native plum group, three species (*P. americana*, *P. hortu-*

lana, with its variety, *mineri*, and *P. angustifolia*) have furnished nearly all of the cultivated varieties. The Beach plum (*P. maritima*) is the parent of but one variety, of doubtful value. The Marianna, so largely used for stocks, and the De Caradeuc are closely related but of uncertain origin. A few varieties are probably hybrids, although the manner in which most of them originated is more a matter of speculation than of definite knowledge. There are still other varieties that cannot even be classed as hybrids and whose ancestry is likely to remain undetermined.

Professor Bailey, of Cornell, who has given the whole plum group careful study, arranges the native varieties into groups as follows:

The American group—*P. americana*.

The Wild Goose group—*P. hortulana*.

The Miner group—*P. hortulana*, var. *mineri*.

The Chickasaw group—*P. angustifolia*.

The Marianna group—of uncertain origin. De Caradeuc assigned to *P. cerasifera*, and Marianna thought to be a hybrid.

The Beach plum—*P. maritima*.

The wild plum of the Pacific coast—*P. subcordata*.

Hybrids, unclassified varieties—of uncertain origin.

Our foreign introductions belong to two groups, viz.: The European plums, such as Lombard, Green Gage, and the numerous *Prunus*, to *P. domestica*; the Japanese plums to *P. triflora*.

While the European plums can be grown in some sections, the tender nature of the fruit-buds makes them uncertain on the eastern slope, except in favored localities, and dependence must be placed mainly upon the *americana* varieties. In the fruit districts of the western slope the Wild Goose is eminently successful and stands at the head of the list of profitable varieties, but it is probably too tender for the eastern slope, certainly for the northern and central districts.

In general throughout the West the native plums are proving profitable. Even in districts where the *domestica* varieties are successfully grown, the native Red plums sell in competition with them, and at remunerative prices. While it may be admitted that most native varieties are inferior in size and flavor to those of the *domestica* class, it should be remembered that the extended introduction of the natives is comparatively recent, that the improvement in them has been rapid, and that they offer wonderful possibilities in the direction of future development. All the better varieties are very productive. Some show a strong tendency to excessive production, a habit which, if allowed to go unchecked, not only gives inferior fruit, but tends to shorten the life of the tree. With such varieties systematic thinning must be practiced in order to insure regular crops and fruit of the largest size and best flavor. Then, having produced good fruit, if the

grower will exercise the same care in handling that is given other fruits, and will place them on the market in the same attractive packages, the demand which already exists will be greatly stimulated.

PROPAGATION OF THE PLUM.

Most varieties of plums have come to us as seedlings, selected and retained because of their good qualities; they show development or variation from wild types in varying degree, but, with all, the departure is such that we cannot reproduce them through the seed, and, in order to maintain them, we are forced to adopt other means.

All varieties are perpetuated by either budding or grafting, usually on plum stocks. The kinds available as stocks are various, and exhibit as great differences as appear between the varieties to be propagated. No one stock can be regarded as perfectly satisfactory for general use with all varieties, and it follows that care and thought must be exercised in making choice of what shall be used.

The character of the soil, whether light or sandy, or verging on the other extreme of heavy clay, and the general features of the climate will largely govern this choice, but consideration must also be given to the characteristics of the varieties to be propagated.

The desirable varieties have parentage in widely different species, each of which has characteristics peculiarly its own. The derivative varieties follow more or less closely after the parent species, inheriting habits, likes, and dislikes, which must be regarded if we achieve success in their management. Even among derivatives of the same species we may find varieties sufficiently different to call for the use of different stocks and different methods of treatment. This would be looked for among the varieties that have been under cultivation for the longest periods, and is due to the fact that the variation and development from the original type has not been along parallel lines. Differences in climate, in food supply and in general environment have led to divergence, resulting in races which possess distinctive and well-marked characters. Some knowledge, therefore, of the history and derivation of varieties is essential to the propagator in order that he may make intelligent selection of the stock upon which to work his profitable varieties. Successful propagators, well versed in the history of varieties and in the principles of culture, will, however, often differ in their estimate of available stocks, just as they will differ on methods of practice. Strong-growing varieties are not suited to very slow-growing stocks, because they overtop them and the trees are short-lived. On the other hand, success does not follow the attempt to force a slow-growing variety by working it upon a rank-growing stock. The nearer the variety to be grafted corresponds with the

stock to be used in general habit and vigor of growth, the better will be the prospects for health and longevity in the tree..

For the European plums, such as Lombard, Green Gage, and Bradshaw, probably no stock is better than seedlings of some variety of the species from which these varieties came—*P. domestica*. These have been in common use for many years, but in recent years have been in some degree superseded by Myrobalan stocks (seedlings of *P. cerasifera*, a species of European origin). Myrobalan stocks are in common use in European countries, and have rapidly grown in favor with our nurserymen, not because better trees can be grown upon them, but because it is easier to secure good Myrobalan than good *domestica* stock. Seeds of *domestica* varieties that will produce an even stand of stocks is difficult to obtain, and the Myrobalan, which is easier to grow and less liable to injury from parasitic fungi, offers an acceptable substitute. Some nurserymen import the seeds and grow their own stocks; others find it more profitable to import the seedlings. They are usually received during the winter, planted in nursery rows in spring, and budded in July and August.

In the South, the stocks in common use are the Marianna plum and the peach, and very diverse opinions as to their relative merits have been expressed. Probably the differences arise from varying local conditions, for the testimony at hand indicates that on the light and dry soils the peach stock does best, while the Myrobalan is better suited to the heavier and more moist soils. Even at the North the peach meets with some favor as a stock for plums on light soils, but it is too tender for districts where severe winters are common. For the native varieties, Wolf, Weaver, De Soto, and other derivatives of *P. americana*, the natural inference that *americana* stocks would be best seems to be borne out by experience, but the degree of success may depend in a measure upon the seed used. The species is extremely variable in general habit and rapidity of growth as well as in the fruit produced.

Seeds from which to grow stocks should be chosen from vigorous, free-growing trees only. The progeny of such trees will most nearly accord with the varieties to be propagated and better insure the future of the tree. Seeds are obtained in the fall, separated from the pulp, mixed with sand, and kept in a cool, moist place during the winter. If they can be frozen and thawed several times, so much the better, for they will then more readily crack under the pressure of the swelling embryo. In spring they are sown in seed-beds of deeply stirred, rich soil. In the fall the seedlings are lifted, sorted, and packed away in sand in a cool pit or cellar. The following spring they may be planted in nursery rows, to be budded in July and August.

The commencement of the budding season is determined by the maturity of the scion buds to be used; they are buds of the current year's production and must be well matured. Budding may be continued as long as the bark will "slip," and this, as well as the maturation of the scion buds, will be largely influenced by weather conditions. The length of the budding season may therefore vary greatly in different years. Usually, the season with plums is shorter than with peaches or apples. About ten days after insertion the buds should be examined and the bands loosened, if necessary. Where buds have failed to unite the stocks may be rebudded, and this may be repeated as often as the length of the season will allow. Late in the fall stocks on which buds have failed should be taken up and stored for grafting in late winter or early spring. When growth starts in the spring the budded stocks must receive prompt attention. The stock must be "headed down," that is, cut off above the bud, and here practice varies somewhat. Some growers prefer to cut from four to six inches above the bud, while others would at once cut as close to the bud as it is safe. The idea in cutting high is to leave a stub which may serve as a support to which the shoot from the bud may be tied, the stub being removed at the close of the first season's growth. All shoots below as well as above the scion bud must be removed; otherwise they will starve the bud by diverting the sap to their own development. Further production of these shoots from the stock will occur, and they must be frequently checked in order to secure the best growth of the scion.

By far the greater number of plum trees grown commercially are produced by this process of budding. It is the easiest and best way when trees are grown in quantity, but as good trees can be produced by grafting, and often it is more convenient to graft than to bud. At the Colorado station we used both methods and found grafting rather more uniformly successful than budding. I am aware that the idea is current that stone fruits, and particularly plums, are difficult to graft. It is true that certain precautions must be observed that need receive little attention when grafting the apple, but, these simple precautions taken, the work is no more difficult, and success is as certain as with the apple. Of course, the mechanical work of putting scion and stock together must be well done, but outside of this there are three points upon which success mainly depends: (1) The perfectly dormant condition of both stock and scion at the time the operation is performed; (2) the protection of the union by coating with wax; (3) proper care of the plants between grafting and setting in nursery.

The work is usually performed during March or April, and may be continued so long as the dormant condition can be maintained,

Plums, however, start growth under slight stimulus, and a few warm days will end the work, even when all ordinary precautions have been taken. It is best to commence early enough, so that the finish need not be hurried by the weather conditions.

Scions must not only be dormant, but must be neither wilted from drying, nor water soaked from being kept too wet. Sometimes it is convenient to take them from the trees as wanted; more frequently they will be cut late in the fall, or come from a distance, and the question of how to keep them will present itself. They may be kept in an outside cellar or pit, packed in dry leaves, or in moss that is but slightly damp. The aim should be simply to provide conditions that will prevent the loss of moisture, without affording opportunity for the absorption of an excess.

The particular method of grafting to be used is much a matter of taste. Several are available, among which the four following are named in the order of the writer's preference: Veneer, side, whip, and cleft. The side-graft is probably in more general use than any of the others, but after several years' experience with all of them we are inclined to favor the veneer method as giving the most perfect union.

It is not our purpose to here discuss the principles of grafting, but may remark that in all grafting no union takes place between cut surfaces of the wood. It is only through the adjustment of the cambium of the scion to that of the stock that union is secured, and here it is not a union between cells existing at the time the grafting is done, but through new cells formed in extension of the cambium, which is the only channel of communication between leaves and roots. This being true, it seems reasonable that the less the area of cut-wood surfaces the better. The minimum of cut wood is secured by the veneer graft, which only exposes the wood in the oblique transverse cuts at the apex of the stock and the base of the scion. The one valid objection that may be urged against the veneer graft is that the scion is easily displaced. It is easily displaced if carelessly tied, but with reasonable care no trouble need be feared.

Whatever the method used, the union should be thoroughly covered with some protective wax. A liquid wax, to be applied with a brush, is most convenient, and, of several preparations, one known as "alcoholic plastic" answers the purpose admirably. It is made as follows: One pound of resin and one ounce of tallow melted together; remove from the fire, and, after cooling slightly, but while still liquid, add eight fluid ounces of alcohol and stir thoroughly. This preparation must be kept in a corked bottle or other closed vessel to prevent the evaporation of the alcohol. After waxing, the grafted stocks should be returned to the cellar and kept at as low a temperature as

possible without freezing until the time arrives for setting in nursery. The roots may be placed in damp sand, but the scions should be subjected to such a degree of moisture only as will prevent drying out. The practice as here outlined is successfully followed in our station work. In all grafting of plums, the scion should be set low on the crown, so that when planted in the nursery the union may be placed well below the surface.

The plum is seldom worked above the ground, and there seems to be nothing in the practice to commend it for practical purposes. If it is attempted, it should only be with varieties of close affinity, and trees of equal vigor. Scions from a slow growing tree cannot keep pace with the branches of a strong grower, and if the strong scion is worked on the slower stock it soon outgrows it and the wind breaks it off. A scion of Indiana Red worked on a wild *americana* stock three feet above the ground produced a straight whip five feet and four inches long; three feet above the union the new growth had the same diameter as the stock at the ground. It yielded to a moderate wind. Sometimes, when new varieties are procured for trial, a few scions are worked on old trees of some *americana* variety, with a view to obtaining fruit quickly. Thus, trees of Ogon, planted in 1894, have not yet fruited, because the tops have killed back every year, but scions from the same trees, taken at the time of planting and worked on *americana*, have given us fruit for four seasons. Several other varieties treated in the same manner at the same time have fruited, but all, or nearly all, are now dead.

PRUNING.

Plums are pruned for the purpose of forming and maintaining a symmetrical, well-balanced top. Five or six branches, equally distributed about the stem and having some vertical separation, are selected to serve as a framework of the top. All others are removed and the leader is shortened. The branches retained should be cut back to some extent, but this, as well as the shortening of the leader, must be determined for each tree, being dependent upon the root system and the apparent vigor. In shortening the branches and leader, the cuts should be made with reference to selected buds so placed that the future extension may be in the right direction. During the summer rub off shoots that start where they are not wanted, and pinch the tips of rampant branches. The second spring, before growth starts, the shoots produced the previous year should be shortened to encourage the production of secondary, interior branches, and the third year this is repeated. From now on no pruning is needed, except to remove branches starting from wrong places and to control the too vigorous branches. This is best done by summer pinching, and, in general, it

may be said that the less the knife is used on plum trees the better it is for the trees. Most varieties require very little pruning after the head is once formed.

SOILS.

Plums will adapt themselves to almost any soil that would be chosen for apples or pears. *Domestica* varieties are perhaps best on heavy clay, and choice may be more restricted with them than with most other sorts. The native varieties are suited to a wide range of soils, but no tree will do well on wet, mucky soils, and, as the plum is a rank feeder and a heavy bearer, the soil must be of good fertility.

IRRIGATION.

Frequency in the application of water is so entirely dependent upon the character of the soil that no rule can be made to govern it. How best to irrigate must be learned by experience for each orchard. In a general way, it may be said that young trees require more water the first season than is necessary in succeeding years. Trees that are bearing, however, should receive almost if not quite as much as young trees; it is necessary for the best development of the fruit. The soil of the Colorado station orchard is quite compact; water does not spread quickly, and each irrigation is prolonged for a greater time than would be necessary on more porous soils. When water is available, we aim to apply it once in ten days for young trees; somewhat less frequently for those older.

The effects of drought during July and August are frequently seen in small, inferior fruit. Reasonable care in the application of water during this period will well repay the trouble in the increased quantity and better quality of fruit. It is, however, possible to apply an excess that may work as great injury as the most severe drought. It is only by studying the appearance of the trees and the condition of the soil that we can arrive at a correct adjustment of the quantity to be applied and the time to apply it. It is the practice at the Colorado station to withhold water after the 1st of September, in order to check growth and allow the wood to ripen. If growing conditions are maintained through the fall, the young and succulent wood of even the hardest varieties is in danger of being killed by low winter temperatures, but if well ripened it survives the extremes without injury.

Twice within the last six years we have had open winters that proved more productive of injury to trees than those of continuous cold. There were long periods of warm weather, with no frost in the ground, and no precipitation to supply the continuous evaporation. The soil became very dry and the trees suffered in consequence. To guard as much as possible against such injury, it is the practice to give a late irrigation usually in November. If the ground can be

well saturated at this time it is of advantage to the orchard, whether the months following be cold or warm. If warm, the soil will not so soon become dry, and danger from this source is lessened; if cold and the soil be continuously frozen, the moisture is retained and the conditions for spring growth improved.

The system practiced is to furrow for each irrigation, using a one-horse plow and turning from the trees on both sides of the row. Water is run in the furrows for from twelve to thirty-six hours, according to the supply available and the condition of the soil. As soon as practicable after irrigating, a harrow is used to close the furrow and smooth the surface. The aim is to keep a constant mulch of loose soil on the surface, so as to check evaporation as far as possible.

PLANTING DISTANCE.

The most common practice is to plant 15x15 feet, but this is too close for fully developed trees of spreading habit. A better plan is to plant 15x20 feet, or to adopt the accepted California practice and allow 20x20 feet. There seems to be a decided preference for low-headed trees, on the ground that they are less liable to injury from winds, and that less trunk is exposed to the action of the sun. With low-headed trees the disadvantages of close planting are more quickly apparent. The best-formed trees are those headed at from thirty to thirty-six inches from the ground, and this is the distance we prefer.

Young trees are frequently injured by what are known as "frost cracks"—a longitudinal splitting of bark and wood on the south side of the trunk, occurring in late winter or early spring, and attributable to the extreme daily range of temperature which often occurs at that season. To guard against this injury, the trunks should be protected in some way. Various devices have been used, but we found wrapping with burlap the most effective and least expensive. Burlap that had been used for baling was purchased at dry-goods stores for two cents per pound, and cut into four-inch strips three and four feet long; one pound giving an average of nine strips. These are wound spirally on the trunks, being held at the top by a lap and by tying with cord at the bottom. One man can cover from fifty to sixty trees per hour, with the material prepared and ready at hand. The covering is applied in November and removed in April or May. The same bands will serve for two or three seasons. The whole cost is less than one cent per tree, and will repay the trouble.

ARRANGEMENT OF VARIETIES.

The Wild Goose plum has long been regarded as infertile when isolated, and the same complaint has occasionally been made regarding other varieties, but the experiments carried on by Professor Waugh, of Vermont, in 1896 and 1897, indicate that the actual extent

of self-sterility among varieties of plums has by no means been appreciated or even suspected. His tabulation shows that of 6428 blossoms covered, on fifty-six varieties, representing all classes of plums, only five produced fruits, and from the experiments he draws the conclusion that "for all practical purposes, all classes and varieties of native plums may be regarded as absolutely self-sterile." It is possible that these results might vary with different seasons and in different localities, but, making due allowance for possible variations, the results are startling enough to warrant the attention of plum growers everywhere. The cause of this sterility appears to lie largely in the inefficiency of the pollen of the flowers of a plant upon the stigmas of the flowers of the same plant. It lies in a condition known to exist among many wild as well as cultivated plants. One of nature's provisions for securing cross-fertilization, and the plants come under the recognized Knight's law that "nature intended that a sexual intercourse should take place between neighboring plants of the same species."

Self-sterility may also be due in some degree to imperfect pistils, the cause for which must be sought in some physiological weakness of the tree, such as might be brought about by the work of insects or disease, or from a feeble condition following the production of a phenomenally heavy crop of fruit. Or it may be due to unfavorable weather conditions prevailing at blooming time.

Recognizing, then, the existence of self-sterility among plums, the aim should be to so associate the varieties that one may supply pollen for the other. No data are at hand to warrant any definite statement as to what varieties are especially adapted to the fertilization of certain other varieties, but it is perfectly plain that to be of use to each other the varieties must bloom at the same time.

The varieties now available from which to choose show a rather wide range in blooming period; some bloom together, some finish before others begin, and some overlap. All are much influenced by the weather at the time, and this may vary greatly in different years, not only in the appearance of the first flowers, but in the length of the blooming period. While irregularities may occur from one season to another, it is probable that the relative periods of the different varieties will remain much the same.

BLACK-KNOT OF THE PLUM AND CHERRY.

From Bulletin of the Tennessee Experiment Station.

The black-knot of the plum and cherry is one of the most striking and familiar of the fungous diseases which attack our cultivated plants. That it is a fungous disease there is no longer any question, although for a long time the trouble was thought by many to be due to the attacks of insects. It is a parasitic plant, belonging to the great group of plants called fungi, that causes the development of the black knots, and its characters and habits have been closely studied by mycologists, and are now very well understood.

In the Eastern and Middle states this disease is of common occurrence, and is often very destructive. Wild plum and cherry trees are attacked by the disease, and from these it may spread to the cultivated sorts; the disease may also be carried to new localities by the introduction of unhealthy nursery stock.

The knots are often very large, and not infrequently they completely surround the branches. The surface of the knots is black, more or less irregular, and free from bark, excepting, perhaps, here and there a fragment which has been carried up with their growth. Around the base of the knots one will find the raised and broken edges of the bark of the branch, showing that they (the knots) originated beneath it. If closely examined, the surface of the mature knots will be seen to be studded with slightly elevated and rounded projections, imparting to it a pimply appearance. Each one of these little pimples represents a fruit of the fungus, which is many, many seeded.

They have thick, black walls, and at the top of each is a small opening through which the seeds, or *spores*, as the seeds of fungi are called, escape when ripe. In the interior, or cavity formed by the fruit walls, there are a great number of delicate, elongated sacks, and it is within these that the minute spores are formed, usually eight in each sack. Each sack is hardly more than one three-hundredth of an inch long or high. The spores, which consist of two cells of very unequal size, are, of course, exceedingly minute.

The description just given is that of the mature stage in the development of the fungus. There are other and earlier stages, in which spores or reproductive bodies quite unlike those just described are produced. One kind is borne on dark, olive-green stalks, which, during the period of their formation, cover the knots so thickly that their surfaces resemble silk plush or velvet.

Other spores, supposed to belong to this fungus of black-knot, are

formed within cavities in the substance of the fungus similar to those in which those of the mature stage are produced. These are termed *stylospores*.

Some time during the summer the spores of the black-knot fungus, which have found lodgment in the crevices of the bark of the trees, germinate and push their germ-tubes into the cambium or growing layer just underneath the bark, and the action of the fungus growth upon the living cells of the cambium excite these into rapid and irregular development, resulting finally in the production of the well-known knots. By autumn the increased growth of the cambium is often externally manifest as a slight swelling along the branches; little change occurs during the winter, but in the spring following the swellings begin to enlarge rapidly, and often attain their full size in a few weeks.

The bark covering the forming knots expands for a time with their growth, but is finally burst asunder, exposing the diseased tissues composing them. The fungus itself continues alive and active throughout the summer and following winter, when the spores of the mature stage, referred to above, are produced, after which the parasite dies, and there is left a mass of open, dead tissues which offer protection and support to various insects that are likely to add to the injury already occasioned.

The fungus of black-knot is remarkably well supplied with means for reproduction, each spore produced being capable of developing a new fungus growth and consequent "knot," if it falls under proper conditions. To prevent this spread of the disease, we ought to remove and destroy at once the knots wherever they may appear, both from our orchards and from all wild trees that may be growing in the vicinity. The knots on a single wild tree may yield spores enough to infect the cultivated trees of an entire county. Badly diseased trees of either sort should be cut down and the knots burned or otherwise destroyed at once. When there is only here and there a branch that is diseased, these alone may be removed with a saw or knife, the knots destroyed, and the trees then disinfected by a thorough washing with Bordeaux mixture, or, if the work be done in the winter, with a very strong (30 to 50 per cent.) solution of sulphate of iron. These solutions, if well applied with a strong force-pump, will doubtless destroy or at least prevent the germination of any of the fungus spores that may be resting on the bark awaiting suitable conditions for development. The same solutions, if applied directly to the newly developed knots, would probably prevent the formation of the spores, but would not be likely to check the growth of the fungus occupying the deeper tissues. The spread of the disease might thus be prevented, but the injury then going on could not be checked.

The knots ought to be removed on account of the attraction they offer to insects, if for no other reason. When the swellings appear on the larger limbs and trunks of the trees, cut them out carefully, extending the cut from two to three inches above and below the knots, and then paint the wounds, first with a strong solution of iron sulphate, and then with some oil paint. From the contagious character of the disease, it can be stamped out only by concerted action, and the extent of the losses which it may occasion when well established make it a subject for state consideration. Now is the time to take action on this matter. Our fruit interests are too important not to demand the protection which the state can give by stamping out the disease in the sections where it now exists, and by preventing its further introduction through diseased nursery stock.

REMEDIES FOR BLACK-KNOT.

From Bulletin No. 81 of the New York Experiment Station.

Many remedies for the black-knot have been suggested but none has proved to be efficient. The most generally recommended preventive measure is to cut out the knots and destroy them. This work should be done as soon as the knot is observed, and if well carried out it is an excellent method of exterminating the disease.

Since fungicides have come into use, spraying for the black-knot has been recommended. The conclusions drawn by Maynard from the experiments of one season recorded by him were that "the number of warts were very decidedly less where treated with the copper mixture than where untreated, . . . and we believe that the plum wart may be held in check by this remedy."

A thicket of Morello cherries which had been treated during two seasons produced only 165 knots. From another portion of the same thicket which had not been treated there were cut 2002 knots on April 25. On November 26 of the same year, this portion yielded 3466 new knots, an increase of nearly fifty-eight per cent. Had the sprayed portion remained untreated, it may be supposed that a similar increase would have taken place in this part, making the assured number cut within a fraction of 2000. The reduction of the number of knots from 2000 to 165, considering the present state of our knowledge and the conditions under which the experiment was carried on, is encouraging, and point to a final control of the disease.

Some of the applications which now appear necessary for the control of the black-knot are to be made when other diseases require treatment. This necessitates but little extra labor in spraying for the prevention of the knot.

The spraying of plums and cherries to protect them from the black-knot fungus, as stated, can be carried on with profit in all sections where this disease threatens to interfere seriously with the profitable cultivation of these fruits.

BORDEAUX MIXTURE.

Copper sulphate.....	6 pounds.
Quicklime.....	4 "
Water.....	40 gallons.

Dissolve the copper sulphate by putting it in a bag of coarse cloth and hanging this in a vessel holding at least four gallons, so that it is just covered by the water. Use an earthen or *wooden vessel*. Slake the lime in an equal amount of water. Then mix the two and add enough water to make forty gallons. It is then ready for immediate use. For rots, molds, mildews, and all fungous diseases.

AMMONIACAL COPPER CARBONATE.

Copper carbonate.....	1 ounce.
Ammonia.....	enough to dissolve the copper.
Water.....	9 gallons.

The copper carbonate is best dissolved in large bottles, where it will keep indefinitely, and it should be diluted with water as required. For same purpose as Bordeaux.

COPPER SULPHATE SOLUTION.

Copper sulphate.....	1 pound.
Water.....	15 gallons.

Dissolve the copper sulphate in the water, when it is ready for use. *This should never be applied to foliage, but must be used before the buds break.* For peaches and nectarines, use twenty-four gallons of water. For fungous diseases.

PARIS GREEN.

Paris green.....	1 pound.
Water.....	250 gallons.

If this mixture is to be used upon peach trees, one pound of quicklime should be added. Repeated applications will injure most foliage, unless lime is added. *Paris green and Bordeaux can be applied together with perfect safety.* The action of neither is weakened, and the Paris green loses all caustic properties. For insects which chew.

LONDON PURPLE.

This is used in the same proportion as Paris green, but, as it is more caustic, it should be applied with the lime, or with the Bordeaux mixture. Do not use it on peach or plum trees. For insects which chew.

HELLEBORE.

Fresh white hellebore.....	1 ounce.
Water.....	3 gallons.

Apply when thoroughly mixed. For insects which chew.

KEROSENE EMULSION.

Hard soap.....	$\frac{1}{2}$ pound.
Boiling water.....	1 gallon.
Kerosene.....	2 "

Dissolve the soap in the water, add the kerosene, and churn with a pump for five to ten minutes. Dilute ten to fifteen times before applying. For insects which suck, cabbage-worms, and all insects which have soft bodies.

OTHER PLUM-TREE DISEASES.

From Bulletin No. 92, North Carolina Experiment Station.

POCKETS OR BLADDERS.

Plum pockets, or plum bladders, as it is indifferently called, is a disease produced by a fungous parasite. This disease is probably of foreign origin, but is now naturalized in America wherever the plum is grown. It attacks the light-colored plums with greatest virulence. The Wild Goose and Marianna are especially susceptible, but the Japanese varieties seem exempt so far. The disease attacks the leaves and branches, also producing a sort of blight very similar in appearance to the blight of peach twigs, which is, however, caused by a different fungus. On the fruit it causes the recently formed plums to swell out and become hollow, producing what are aptly called bladders. Such fruits soon fall to the ground. The spores of the fungus pass the winter in the diseased twigs and probably also upon the remnants of the rotten fruit on the ground and in the fallen leaves.

Remedies: Collect and burn all leaves as soon as possible after they have fallen. Cut back severely all branches or twigs which have borne diseased fruit, or which show the blight-like blackening. Early in spring, as soon as the flower-buds begin to burst, sprinkle the ground under the trees with air-slaked lime. Spray before the buds start with the Bordeaux or copper sulphate mixtures diluted one-third more than the formula gives.

SHOT-HOLE DISEASE.

Like the other stone fruits, the plum is subject to a fungous leaf parasite which produces small black spots, which soon wither and fall away, leaving the leaf full of small, round holes, sometimes called "shot holes." The fungus passes the winter in the fallen leaves of the preceding year. It does not attack the fruit or twigs.

Remedies: Rake up and burn all leaves as soon as they fall. In spring spray with diluted Bordeaux or sulphate mixtures as soon as the leaves are one-half grown, and repeat in two weeks. Usually two treatments will be sufficient.

POWDERY MILDEW.

This fungus works entirely on the surface of the leaves, drawing its nourishment from the cells by means of minute suckers called *haustoria*. Badly affected leaves appear as if dusted with a white powder and this suggested the common name. The fungus does not usually appear until late in summer.

Remedies: Being on the surface, it is easily reached by any of the fungicides in common use. Finely powdered sulphur, which has been successfully used in combating the closely related powdery mildew of the grape, would probably be equally effective in destroying this parasite.

LEAF RUST OR BLIGHT.

A disease which causes the leaves of the plum to fall off in summer; is sometimes common during dry weather. This is caused by a fungous parasite which attacks the leaves only, producing red or yellow spots which soon spread all over the leaf. The fungus lives through the winter in the fallen leaves.

Remedies: Rake up and burn all leaves as soon as they fall; spray the leaves as indicated for shot-hole fungus.

BROWN ROT OF PLUMS.

From Bulletin of Virginia Experiment Station.

Concerning brown rot we may say that only the most persistent effort can hold this fungus in check. As all growers have observed, decayed fruits hang to the twigs and persist over winter. It is from these, in the early days of spring, that an abundant crop of spores is born, and the petals of the flowers, young leaves, and even many branches, are attacked. These mummied fruits also hang on all summer, and continue to produce spores. Hence, by the time the fruits become half grown or begin to mature, the infecting spores may come from the old, decayed fruits of the previous year or from more recent infection on the young growth of the current year. Whenever the fruit has become badly attacked, treatment is quite useless.

The proper plan is to remove all decayed fruit from the orchard when the trees are free from foliage, as it can be easily seen at this time; then, before the buds swell in the spring, wash the trees thoroughly with a solution of concentrated lye or of sulphate of copper. The first solution should be made by dissolving eight cans of lye in fifty gallons of water, and the copper sulphate solution by dissolving two pounds copper sulphate (bluestone) in fifty gallons of water. I consider the lye preferable, but the latter may be somewhat pleasanter to handle. This washing is very important, and, perhaps, does as much real good as all later work.

The later washings should be given as follows; Weak Bordeaux, just as the color shows plainly in the bloom-buds, and repeated soon as bloom has fallen. If the work is well done to this point, very little infection will have survived. Concerning value of later sprayings I am very much in doubt. If the early washing is not well done, I have almost no faith in later treatment.

All washing or treatment of orchards should be done with a spray pump. Poor, half work is usually a dead loss.

CRACKED PLUMS.

We find some complaint of this nature, probably the result of the climatic conditions and irrigation combined. Some of the cases are rather serious, and may result in loss; others simply hurt the looks of

the first fruit and cannot be noticed when the fruit is cured, except now and then a piece where a hard spot may possibly be noticed. We have not noticed any cases of the brown rot of the prune to which our attention has been called from the southern districts, but something similar in a few trees of young apricots. Such cases should be marked and a spray of Bordeaux mixture applied next spring which will destroy the germs of the rot.

PLUM-TREE FUNGUS.

The fungus may be looked for from the time of flowering till the fruit is mature, says Professor Pammel, of the Iowa Agricultural College. Much may be done by removing the diseased plums from the trees in the autumn. I have made observation on this fungus for a number of years and am certain that it is much more troublesome where mummied plums remain on the tree. Some years ago I observed the fungus upon the flowers. It attacked the petals, stamens, and pistil. Soon the whole branch became affected with this blight. In a few days not a single healthy flower remained on the tree. It was also noticed to start from certain parts of the tree. I soon located the cause in the old monilia-attacked plums which were hanging on the trees. In quite a number of cases the starting-point was thus found to be in these old, diseased plums. The object-lesson is plain: remove all of the diseased plums in the fall. Horticulturists often overlook this important point in the treatment of diseases. Rubbish heaps containing the spores of fungi are too often neglected. They should be burned.

INSECTS INJURIOUS TO THE PLUM.

POULTRY AND PLUMS.

A writer in the *Poultry Messenger* says: "The prairie region of the West seems to be the home of the plum. This fruit is found in a wild state in the greatest abundance along the river bluffs and every place where there is natural timber. And yet the cultivated plums always meet with ready sale in towns and villages. Many of the cultivated varieties are natives, improved, of course, by careful selection and propagation. They are the equal of the best California varieties, and, owing to their greater freshness when placed on the market, are generally preferred to them by consumers. They are the easiest to grow of all the tree fruits in this section of the country. And they do best when grown in the midst of the runs given to the poultry. The insects which war against the fruit are choice delicacies for the fowls, and but few of the most destructive of these insects will escape their sharp eyes when they have constant access to the

ground. The people who give free run to their poultry, and those as well who keep it confined, if they have ground room suitable for the growth of plum trees, are throwing away dollars in not planting plum trees. Under right management the fruit can be made to pay for the keep of the hens, leaving all returns from them net profit. Plums cannot be successfully grown in all localities, but there is no question about their success within the territory above named, and every one can have the profit of them who will reach forth his hand to take it."

PLUMS IN THE CHICKEN YARD.

A writer in the *Indiana Farmer* says: "Theories vanish by the side of facts in every avocation. I have at the present writing three Robinson plum trees loaded with ripening fruit and two others with not a plum left. The five trees were set on the same kind of ground seven years ago and have had the same culture. The same results have been derived for the past three years, the three trees bearing a full crop of sound plums, and the two a crop of wormy fruit—worthless. The three fruiting trees are in the chicken yard; the others outside. The ground in said yard is not plowed, but early in the spring is swept and kept hard and smooth. Under these trees I scatter bran and screenings, and 'biddy' does the work of eating the pestiferous insects. While looking for the little seeds and specs of bran she garnishes her food with the spicy curculio. I know this to be true, for I have the evidence. Now, for seven varieties of plums, I must speak a good word for the Robinson. It always produces. I have Wild Goose, Marianna, English Blue, Lombard, *Prunus simonii*, etc., but the Robinson gives me the only crop in this year of 1898. I have been out with saw and lumber this morning and propped up the limbs that are hanging almost to the ground with tempting fruit. Even the chicken yard is not a sure defense with other varieties this year, but the Robinson, where plenty of fowls are enclosed and fed, will not disappoint the planter."

CHICKENS IN THE PLUM ORCHARD.

One cannot live on a fruit farm and allow the chickens full range during the summer, for they are very destructive to grapes and the smaller fruits. As one of our plum orchards extended quite close to the chicken-house, we decided to fence off one part of the orchard with six-foot wire netting, with the following results: Plums have been almost a total failure with us for the past three years, except within the part fenced off. Some trees within the chicken yard bore as high as five crates last year, while all bore a good crop. The row just outside of the fence bore perhaps one-half of a good crop, while the next row and the remainder of the orchard bore from a few boxes to nothing at all. Trees within the yard this spring are looking much brighter

and made a far better growth than the remainder of the orchard, and at this writing, May 3, the fruit is set much heavier. Now, as to the reason, I can only say that chickens are great cultivators, scratching and enriching the soil. All the summer through the ground is kept moist and free from weeds. Some say the chickens eat the bugs and cause a great crop of fruit. There is nothing in that at all. It is very true a chicken will eat the curculio, but that does not cause the tree to set fruit. In conclusion, I would say fence off your plum orchard for a chicken yard, and the heavy crops will more than pay the price of fencing. At the present time all of our plum orchards—Burbank, Abundance, Miner, and Wild Goose—have set fruit, with a fair prospect of maturing a crop.—*M. E. C., in Kansas Farmer.*

PLUM CURCULIO.

From Bulletin No. 65, Utah Experiment Station.

This pest is very injurious to plums, cherries, peaches, and apricots. The mature insect is a dull gray, rough-backed beetle, about three-sixteenths of an inch long. As soon as the tiny fruits are formed the female beetle is on hand to "sting" them. "Stinging" consists of the female puncturing the skin, then depositing an egg in the puncture, and cutting a crescent-shaped slit at one side and beneath the egg. It is then in a little flap and will not be crushed by the development of the fruit. In about a week the egg hatches and the larva tunnels to the pit, where it feeds for from three to five weeks, and then escapes and enters the ground to a depth of a few inches. Here it transforms to the pupa stage, from which it changes to a mature insect in three or four weeks. The beetle spends the winter under any rubbish or under the rough bark of trees.

Remedy: The universal practice is to catch the beetles by jarring. There are several methods of doing this, the most ordinary of which is to spread a sheet or pieces of canvass on the ground beneath the tree and strike the limbs with a padded mallet. When disturbed the insects "play 'possum," and drop on the sheet, from which they are readily collected and destroyed.

A more improved method used in commercial orchards is a two-wheeled cart upon which is built a light frame in the position of the ribs of an inverted umbrella. Over this frame is spread a canvas, the center part of which is two or more feet lower than the edge. The canvas has an opening at the center, below which is fastened a zinc box about one foot in length, breadth, and depth. On the front side of the canvas is an opening wide enough to accommodate the trunk when the cart is pushed under the tree. A few jars with a padded mallet dislodge the beetles and they drop on the canvas from which they are swept into the box below, after which they may be killed in whatever manner is most convenient. The jarring should be begun as soon as the petals fall and be continued as long as any insects are caught. It is best done in the morning while the insects are quiet; later in the day they become active and fly away when disturbed.

Spraying with poisons is also recommended, but with varying results, by different experimenters. Paris green, London purple, or green arsenoid, one

pound, with from three to five pounds of freshly slaked lime, in 250 gallons of water, should be applied first when the leaf-buds are opening. The second application should be given as soon as the petals fall, and a third about ten days later. The poison may be combined with Bordeaux mixture at the rate of one pound to 250 gallons when the latter is used against the shot-hole fungus.

ANOTHER CURCULIO CATCHER.

Orange Judd Farmer.

The curculio attacking quinces, plums, peaches and a few other fruits is but little affected by spraying mixtures of any kind. The mouth-parts of the insect are elongated in the form of a beak, and when the curculio damages the fruit, very little if any of the poisonous substances which may have been applied in the spraying solution is taken into the system. The most effective means of combating the insect, therefore, is to take advantage of its habit of dropping to the ground when alarmed. If a cloth is spread under the tree and the limbs struck with some kind of a pole, the insects will drop at once onto the sheet and can be collected and destroyed.

Placing the sheet about the trees is a slow process. Consequently, the Cornell station has suggested a device. It consists of an arrangement built on the plan of a double-wheeled wheelbarrow with much elongated axle. On this is arranged a number of projecting arms radiating from a point midway between the two wheels. A canvas or any kind of cloth is attached to these arms, with an opening on the far side large enough to admit the trunk of the tree. This is very inexpensive and easily built.

The time to begin jarring is still a question, but as the curculio are usually more active in the early morning, possibly the work had best be done then. These beetles begin operations as early as May, and it will not do to delay jarring them much after they appear. Some years they will not appear until the latter part of July. Those who practice this method successfully jar the trees every day until the numbers are so small that they do not affect the fruit seriously. In one orchard, noted by the Cornell station in 1897, 200 curculio were jarred from seven trees, and it is not uncommon to get as high as fifty from one tree at a single jarring. This process involves considerable labor and expense, but it costs only about fifteen to twenty cents per tree for one season. After the insects are captured they can be destroyed by the most convenient method. Some put them in kerosene or boiling water, while others have a charcoal stove built for the purpose, in which everything that falls on the sheet is burned.

A CURCULIO PREVENTIVE.

Rural World.

Clear the ground under the trees of undergrowth of any nature, then stir the soil about one inch deep, and apply on top (in early spring, before any fruit is set, or, if soil will permit the working, before

bloom falls) the following: One bushel of air-slaked lime, one bushel of wood ashes, two pounds of concentrated lye, two pounds of copperas, ten pounds of sulphur, one package of salt; mix with a hoe, and apply through an old sieve. Protect the hands while applying it, or they will suffer much.

PLUM-TREE APHIS.

From Bulletin No. 85, Utah Experiment Station.

The plum-tree aphis lives over winter in the egg stage. The eggs hatch early in spring into a generation of wingless females, known as "stem-mothers," which soon attain maturity and begin to produce living young. This second generation is also entirely females, and they, in turn, produce female young. After this manner the succeeding generations are all females until the last generation of the season, which contains males. The sexes then mate and the females lay their eggs on the twigs and buds, for hatching early the following spring into the "stem-mothers." If at any time during the season the colonies of aphids become crowded, or the food supply becomes limited, then winged young are brought forth, and they fly to other host plants and start new colonies.

The aphids congregate on the under sides and suck their food, the sap, from the leaves. As soon as they begin their work the leaves crumple up and the edges turn under, thus partially covering up and protecting the lice. When this condition occurs it is extremely difficult to reach the insect with the spraying solution. The time to spray them is just as soon as the young lice appear in the spring, and before the leaves begin to crumple and the edges to turn under.

The black aphids of the plum collect on the tips of the new shoots, and in case they are securely located before spraying has been done, it is probably best to cut off the infested tips, and burn them. In this way thousands of the lice will be destroyed.

Remedy: Some remedy must be used which kills by contact, and of these there are several, as mentioned below. Whichever mixture is used must be applied early in spring, when the first generation hatches, and as often thereafter as it is necessary to keep the lice in check. The spraying must be done thoroughly, directing the spray so it will drench the lower side of the leaves. Whale-oil soap, one pound to seven gallons of water. Kerosene emulsion, one gallon to from ten to fifteen gallons of water.

NATURAL ENEMIES OF THE APHIDS.

There are several insects which feed upon plant-lice, the most prominent of which are several species of the ladybird beetle. Both the mature beetle and its larvæ feed upon the aphids, and thus are friends to the fruit-grower. A ladybird beetle should never be injured. Other predaceous enemies are the larvæ of the syrphus fly, and the aphis lion or larvæ of a lace-winged fly. There are also a few parasitic insects which destroy many plant-lice.

FRUIT-TREE BARK-BEETLE.

Press Bulletin No. 14, Kansas Experiment Station.

Of the insects that have been introduced into Kansas during the past few years, none seem to be more destructive to stone-fruit trees than the fruit-tree bark-beetle, or shot-hole borer, as it is sometimes called, from its peculiar habit of riddling the bark of the trees with numerous small holes. It has been found in Riley, Bourbon and Allen counties, and without doubt is present in a large number of the other counties of the state. In Allen county it was very numerous, particularly in an orchard of cherry trees which were suffering badly from the cherry scale.

The presence of the pest will probably be first shown by the wilting and falling of the leaves at an unseasonable time. A close examination of the tree infested with the insect will reveal numerous small holes in the bark, from which, in the case of the stone-fruit trees, such as the plum, peach, cherry, etc., there is a considerable exudation of gum. To show how the insect may riddle a tree, a piece of bark less than an inch square, taken from an infested cherry tree, contained nineteen perforations about the size of a pin-head.

The insect that is the cause of the mischief is a small beetle about one-tenth of an inch in length by about one-third as wide. It is black in color, with the exception of the wing-covers and the lower part of the legs, which are reddish.

With the beginning of spring the beetles appear, and commence to bore small, round holes through the bark to the sap-wood, where they make a central burrow or brood chamber, on each side of which little pockets are made, in which eggs are deposited. As the larvæ hatch from the eggs they commence to make burrows away from and at right angles to the brood chamber, which become larger as the larvæ develop in size.

The larva is a small grub about one-tenth of an inch in length. It is footless and white, with the exception of the head, which is brownish.

When the larva has attained its full growth it makes a slightly enlarged chamber, in which it pupates. Upon becoming an adult, the beetle makes its way out through small holes in the bark and escapes. It takes about a month for the insect to go through its various stages, so that during the summer there may be several broods. Many of the beetles, upon emerging, will turn and renew their attack upon the tree, thus increasing the damage that has already been done. In time, the tree becomes completely girdled by the numerous channels, and dies.

Strong and vigorous fruit-trees may resist for a time the attacks of the beetles through the exudation of the gum, which seems to be obnoxious to both the beetles and the larvæ. But if the attacks are con-

tinued for a length of time, the tree may be so weakened that the flow of sap will not be strong enough to repel. In such a case it is not long before the fate of the tree is sealed, unless vigorous and prompt measures are taken for its protection.

To prevent loss from this insect, the tree should be kept in a healthy condition; the stronger the tree the better it can resist attack. Trees that are diseased, or are suffering from the attacks of scales or other insects, seem most subject to attack.

It is a good practice to remove and destroy all dead wood in the orchard, as it furnishes excellent breeding-places for insects and is a source of danger to surrounding trees.

Badly infested trees should be cut down and burned. In the early spring the trunks of trees liable to attack should be coated with an alkaline wash, consisting of soft soap reduced to the consistency of paint by adding washing-soda dissolved in water. Enough carbolic acid should be added to give a strong repellant odor to the mixture. Apply the wash with a stiff brush. Several applications should be made during the spring and summer.

THE PRUNE.

INTRODUCTORY.

It is scarcely to be expected that Kansas will ever grow prunes for commercial purposes; but, as the average Kansan desires to know what is going on in the world and the why and the how of it, and as our people are much given to experimenting, no one can tell in advance what wonderful results may come from horticultural experiments; besides, our people *eat* prunes, and desire to know where and how they grow, the methods of "manufacture," and how to choose the best. They are of the same nature as the plum, and we hope these few pages on the prune, immediately following the plum, will be appreciated. We hope they may enlighten some of our citizens, and make instructive and interesting reading for all.

SECRETARY.

WHAT IS A PRUNE?

DEFINITION IN THE STANDARD DICTIONARY: The edible fruit of a sapindaceous tree; a plum; a *dried* plum used in cookery; as French or Turkish prunes; California prunes. The German prune is a large, dark purple plum, of oval shape, often one-sided; much used for preserving, either dried or in syrup.

Prune tree.—A tree of the genus *Prunus*, which produces prunes.

DEFINITION IN THE CENTURY ENCYCLOPÆDIC DICTIONARY: (1) A plum in recent usage, especially in the western United States; a plum suitable to be dried. (2) The dried fruit of one of several varieties of the common plum tree. The most highly reputed prunes are raised in the valley of the Loire, from the St. Julian and other varieties of plum, the very finest being known as French plums. There is a large and increased production of prunes in California, the variety of plum chiefly grown for that purpose being identical, or nearly so, with that employed in France, while the Myrobalan variety is the accepted grafting stock. Prunes are produced also in Spain and Portugal. German prunes are largely produced, though of second quality. Bosnia and Servia export large quantities. Prunes are stewed as a sauce or otherwise prepared, and valued for their nutritious, demulcent and laxative properties.

NOTES ON PRUNES AND PRUNE RAISING.

The prune was first planted or grafted in California in 1856, and it required about twenty years to get much of a foothold, it being about 1876 before the crop of cured fruit began to assume any size. Captain Bradley planted ten acres as a venture, and when it came in bearing realized \$16,000 from it in four years. This set people wild, and California is to-day prepared to show a crop of from 100 to 125 million pounds of cured fruit the first year when all conditions are favorable to a fair yield. We now see the time when orchards that do not produce well are taken out, but expect the planting to go on until some year Californians will have a crop of 200 million pounds to try their wits on to dispose of.

MONEY IN PRUNES.

A recent issue of the Colusa (Cal.) *Sun* says a Mr. P. V. Berkey shipped 560 sacks of cured French prunes, grown and cured on his ranch three miles above Colusa, on the east side. These prunes weighed when they reached the city 54,300 pounds. They were grown on 600 trees nine years old, making an average of 225 pounds of fresh fruit or 90 pounds of cured fruit to each tree. This, at the low estimate of four cents per pound, will return Mr. Berkey \$2172, or \$3.62 per tree.

THE FRENCH PRUNE CROP.

A correspondent of the *California Fruit Grower*, writing from Bordeaux, France, says:

The annual blooming of prune trees here generally takes place during the first two weeks of the month of March, but this year, in consequence of low temperature, the trees did not blossom until about April 10. This explains, despite the very high temperature which has prevailed for the last three months, the delay in the maturing of the fruit. Harvesting is being done under the most favorable circumstances. The gathering of the fruit commenced in the first week of September and will not be terminated before the end of the month or the first week of October.

The crop is said to be very abundant; pessimists figure it at from 700,000 to 800,000 quintals (French quintal 110 pounds), and optimists figure it at from 900,000 to 1,000,000 quintals. The fruit will be of average size only, from 60-65 to 120-125 to the half kilo (a kilo is 2.20 pounds). It will be of excellent quality, sweet, of good skin, and of excellent conserve. We shall certainly find a little of 40-45 and 50-55 size fruit, but in so small a quantity that it will be impossible to quote them, as they will be sold at fancy prices.

Taking it as accepted that the crop will be 800,000 quintals, you can estimate the output of different sizes as follows:

60-65 fruits to the half kilo.....	75,000 French quintals.
70-75 " " 	200,000 " "
80-85 " " 	300,000 " "
90-95 " " 	100,000 " "
105-130-140 " " 	125,000 " "

The quantity brought to the market up to this writing is calculated at about 72,000 quintals of 80-85 to 130-140 fruit. This explains the high prices paid during the past week for a few baskets of 60-65, 70-75 fruit which have been offered for sale. The situation may continue up to the end of this month for two reasons: First, that the fruits 60-65s to 70-75s are, in the majority of cases, still on the trees; secondly, the farmers, seeing that prices which have actually been paid for some small lots have been very high, will keep the fruit back for some time. Still, it is my opinion that prices will not be well established before the quantities brought to the markets correspond with the importance of the crop—that is to say, not before the end of this month.

Following are the prices recently paid for prunes in bulk on the markets of the producing districts: Sizes 60-65 to the half kilo, 42 francs per 50 kilos; 60-75s, 32 francs; 80-85s, 21 francs; 90-95s, 16 francs; and 100-105s to the half kilo, 13 francs per 50 kilos.

In 1897 the crop was about 250,000 French quintals, and the quantity brought to market up to September 15 of that year had reached 175,000 quintals.

NOTE.—The four sizes, 70-75 to 100-105 bulk prunes, converted into American coin and weight, would be equal to \$3.59 per 100 pounds in Bordeaux. To this add freight, incidental expenses and duty of \$2 per 100 pounds for cost laid down in New York city.

PRUNES IN SERVIA.

The cured-prune industry of Servia is an extremely important feature of that country's exports. It is stated that the excellent and abundant prune crop of 1897 will add fifteen million francs, or close to three million dollars, to the total value of the exports from Servia. The high value placed upon the dried-prune exports for this year is not so much owing to the meager and indifferent crops of Bosnia, Slavonia, and Bohemia, as to an order issued by the minister of agriculture as to the best method of gathering, drying and preparing the article for shipment. The instructions under this order have been enforced with great strictness, says the *Fruit Grower*, of London, and has led to a vast improvement in the quality of the exported product. This excellent result from the supervision of his department has given the minister of agriculture an incentive to exercise more rigorous supervision over other articles exported from Servia which come under the control of the department.

PRUNES AS FOOD.

Speaking of what it terms "the plum famine" in England, the *Fruit Grower*, of London, says: "And the mere fact that the public will, on a pinch, pay from twenty-four to thirty-two shillings per bushel for plums proves that that fruit has become one of the most popular food-products of the day. When we say food-products, we mean it. The fruit is rich in sugar, albumen, and blood-thinning juices, and, when dried and sold in the form of prunes, becomes the most perfect food-product known. Science has demonstrated the fact that people can live in good health solely upon prunes, and, as in this

form they are rich in nutriment and strength-giving properties, sales and prices in the future will be forced up to a phenomenal degree."

THEY TIRE OF TART PRUNES.

We have often explained that, while people who have only been used to dried plums, very sour, at first prefer the tart prunes of the Pacific coast, of which the California Fellenberg and the Italian from Oregon and Washington are types, to the sweet California prunes, this taste soon changes with use, and very soon the sweet prunes are much preferred for steady use. They make a richer and better food. The following from a St. Louis paper shows how the taste inclines in that section :

Italian prunes are not so popular in this market as in some other sections of the country, their tart flavor not being appreciated as much as the sweeter taste of the Petite or French prune. The market on Oregon and Washington Italian prunes is about the same as on California French prunes, except the Italians are weak and lower all along the line, large sizes included.

A NEW PRUNE.

Even in Europe California French prunes are acknowledged to be the best produced, and are winning their way everywhere on their superior merits ; but California fruit-growers have made one serious mistake in being the very last to acknowledge and take advantage of the new fruits originated in their very midst, and have learned to their sorrow, too late, that more enterprising Eastern growers had the market before them. The Sugar prune, of which a very small quantity of grafting wood will be offered to California growers this winter, ripens nearly a month before the common French prune, averages four times as large, shrinks less in drying, and contains more sugar than any other prune. In beauty of form, color, and excellence of flavor, it stands alone. The tree is a strong, shapely grower, and even more productive than the little French prune. Prominent fruit-growers who have seen the Sugar prune acknowledge that the French prune is a back number, and that the old and young prune, almond and the many unprofitable peach orchards must be grafted to the Sugar, the coming prune.

PITTED PRUNES.

A correspondent of the *California Fruit Grower* says: "Is there a growing demand for pitted prunes of a strictly first-class quality? I know the Klondike trade consumed some, and wanted more, but the quality was probably very doubtful, if indeed they were "prunes" at all. Speaking from personal experience, it occurs to me very forcibly that the better class of trade in the United States would certainly strongly favor such an article, and in this connection—but please remember I have no interest whatever in the trees—I would suggest

that the Splendor prune, being a real freestone, and of very small seed, is exceptionally fitted for this purpose. It may be that the Imperial or Clairac prunes, being so large that some trouble is had with the curing, may profitably be seeded for the finer trade. We need among our prune men a few of similar caliber to the Fresno raisin growers, both in the curing and marketing processes."

Commenting on the above, the editor says:

We do not know of a growing demand for pitted prunes, but know no reason why, under right conditions, such a demand cannot be created. The prune men of California have not begun to exhaust the possibilities of this really delicious fruit product. Witness what France has done and is doing with the prune. The Klondike demand for pitted prunes came not from a desire for a fancy article, as such, but because the conditions of freight transportation necessitated a reduction of bulk and weight to the minimum, and because of this a pitted prune was wanted. We know no reason why a pitted prune should not be as desirable in household economy as a seeded raisin.

RUBY AND BLACK PRUNES.

Mr. A. W. Lane, in a paper before the farmers' institute at Hanford, Cal., in speaking about the two methods of curing, says: "I placed upon one tray fifty pounds of prunes in a condition to make rubies, and on another the same amount of black. After curing, the rubies weighed nineteen and one-half pounds, and the blacks twenty-six and one-half pounds." The prunes to make rubies must be picked or shaken from the trees before they are perfectly ripe and sulphured to produce the ruby color.

THE BURBANK PRUNE.

There were recently brought to the Healdsburg (Cal.) *Tribune* office, by John McClish, samples of the new Burbank Sugar prune, dried and ready for market. The samples, which were fair specimens of the prune, would run about eighteen to the pound. This prune, says the paper just mentioned, has many advantages over the French variety. The grafts will bear in about half the time the French requires; it ripens from a month to six weeks earlier, dries quicker, and also contains more sugar than the French prune. Mr. McClish is greatly pleased with the new prune and will secure some 1300 or 1400 buds for himself and other orchardists who are interested in it. In one instance where this prune and the French variety were grafted on the same stock, the latter bore a very few prunes, while the Burbank graft was loaded with fruit.

In the event of phylloxera destroying the vineyards, Mr. McClish believes that this new prune can be most advantageously used on land now occupied by vines. Being very early in maturing, the fruit would reach marketable condition before the moisture in the soil had been drawn out by the hot days of late summer. Were the French

prune planted on this soil the fruit resulting would likely be too small to pay for gathering.

CARELESS METHODS OF CURING.

The president of the Oregon state board of horticulture, Mr. H. B. Miller, makes the following public criticism of methods prevailing among some Oregon orchardists:

The prune growers of Oregon often wonder why their French prunes do not command as good a price as the California product. An examination of the ordinary methods of curing of the average Oregon prune grower explains much of the cause of this difference in value.

I have just returned from a careful investigation of a number of prune driers, and found much carelessness and slovenliness. In the first place, they pick everything from the ground that they find there at the first picking. Some are half rotten, some half dried, some sunburnt, and almost all immature or defective. These are dried and go into the bins with the general crop. Then, again, a strong man goes over the orchard, shaking the trees as hard as he can, bringing off the prunes in every stage of ripeness, many of them altogether too green to make a good product. A dish of these prunes will have about as many different tastes or flavors as there are prunes, and none of them will be truly first class.

Many of these driers are operated in the most careless manner, without thermometer to indicate the temperature, and, as a result, no two lots are cured equally; and so in the drying, as well as in the methods of gathering, many varieties of flavor are developed. After being cured they are often dumped into coal-oil cases, dirty packing boxes, and finally bring up in a dirty barn for storage. The dirt and filth about some of these driers is intensely disgusting.*

Good fruit, clean and pleasant to the taste and uniform in flavor and quality, cannot be produced by such methods and will not command a good price in the market, and, until better, cleaner and more systematic work is done in the gathering, drying and packing of our prunes, we will be far behind the California price.

In the first place, the sunburnt, immature and partially decayed fruit should not be dried. The trees should not be shaken, but the fruit should ripen on the tree and be allowed to drop, and in this way you will secure uniformity of ripeness. A careful uniformity of temperature for drying should be maintained and the fruit removed when it reaches a fixed standard.

Prune buyers should examine the quality of fruit much more carefully than they do, and by variation in prices reward the careful and conscientious producer for his good work. So far the buyers have offered so much for dried prunes, regardless of their real qualities. Associations for elevating the standard of quality will do much good. I realize that many of the fruit-growers are doing good, conscientious work, and are turning out a first-class product; but I have been surprised at the extent of careless methods in gathering, drying and caring for the prune, and I desire to urge upon all the utmost attention to every detail of production.

*This grade sells in Kansas at six pounds for twenty-five cents.—SEC.

VARIETIES OF PRUNES AND PROCESSES OF CURING.

From Bulletin No. 45, Oregon Experiment Station.

At present there are but three varieties of prunes largely grown in Oregon—the ITALIAN, or Fellenberg; the PETITE, or French or Robe de Sargent; and the SILVER, or Coe's Golden Drop. By far the major part of these are Italians, the Petites being second. Most of the other varieties grown now are sold, when cured, as one or another of these three varieties. All black prunes are sold as Italians, amber ones as Petites, and light-colored ones as Silver.

ITALIAN (Fellenberg, German, Swiss).—Medium size or large, roundish, but tapering at both ends; suture small but distinct; color dark purple with a heavy bluish bloom; stalk one inch long; cavity shallow; flesh yellowish green, juicy, parting easily from the stone; flavor sweetish, subacid, delicious. Tree hardy, vigorous, very productive; rather late. It is not known where the Italian prune originated, but it has been grown in Italy for a long time, where it finds great favor in the fresh state. The Italian is at present the leading prune in the Northwest, probably more than four-fifths of the trees in that section being of this variety.

PETITE (Prune d'Agen, Prune d'Ente, Lot d'Ente, French, Robe de Sargent).—The fruit, as grown in Oregon, may be described as follows: Medium size or small, oval or egg-shaped, not uniformly pyriform; suture small, distinct; color violet-purple with bright-colored bloom; stem short, slender; cavity small and shallow; flesh greenish yellow, sweet, full of sugar, rich and delicious, clinging slightly to the stone. Tree hardy, strong grower, very productive. This is the prune most widely grown in the great prune-growing countries, the favorite in the markets, and is mostly known as Prune d'Agen, excepting in the Northwest, where it is always called the Petite.

SILVER (Coe's Golden Drop).—Size large, oval or roundish; suture distinct, one side abnormally large oftentimes, necked; color light yellow in the sun, dotted with small red spots; stalk stout, nearly one inch long; flesh yellow, juicy, firm, adhering slightly to a very pointed stone; flavor rich, sugary, good quality; tree a precarious grower, but very productive when all conditions are favorable; season late. This variety originated with a Mr. Coe in England in the early part of this century, and received the name of Coe's Golden Drop. A few years ago it was introduced in the Northwest as a new variety, the Silver, a supposed seedling. Much discussion was engendered because of the close resemblance to Coe's Golden Drop, and finally led to the appointment of a committee from the state horti-

cultural society to investigate the matter. The investigating committee reported that the seedling Silver prune tree was a grafted Coe's Golden Drop plum.

REINE CLAUDE (Green Gage).—Fruit small and round; suture not well marked, but showing from stalk to apex; color yellowish green, sometimes, or in the sun or at maturity, slightly marbled with red; stalk short and slender, and inserted in a shallow cavity; flesh yellowish green, free, juicy, melting; flavor delicious, mildly acid, sweetish, unsurpassed. Tree of low, slow-growing, spreading habit; very productive. The nomenclature of this variety is somewhat mixed, from the fact that the trees come fairly true from seeds, and there have thus been propagated several varieties closely resembling the Reine Claude. There is much discussion as to whether our Reine Claude is the Green Gage plum of the East. The writer feels sure that those he has seen in Oregon are the same. For a prune in the fresh state we have no superior, in flavor, to the Reine Claude.

YELLOW EGG (White Egg, Magnum Bonum).—Large, oval, tapering at both ends; suture very prominent; stalk about an inch long and inserted in a very shallow cavity having a fluted border; flesh, when ripe, of deep golden color, dotted with white dots, and covered with a thin white bloom; flesh yellow, clingstone, juicy, quality rather poor, subacid or sweetish, coarse grained. Tree fairly vigorous and fairly productive. Chiefly desirable on account of the splendid appearance of the fruit.

GERMAN.—A name applied to several varieties of plums and prunes, the name representing a class rather than a variety, since the tree comes fairly true from seed. The German prune is a great favorite in central Europe, because of its being easy to propagate and grow. It is an abundant bearer, and of fair quality and easy to cure. Fruit medium size, long, oval, tapering at the ends, swollen on one side; suture very distinct; color dark purple, with a thick blue bloom; stalk an inch long, slender, inserted in a shallow cavity; flesh firm, and of a greenish color; freestone; flavor good, subacid, sweetish. Tree vigorous and productive. Two weeks earlier than the Italian.

DOSCH.—Hon. Henry E. Dosch, horticultural commissioner, writes as follows concerning the prune bearing his name, and which originated with him: "Replying to your favor regarding the Dosch prune, I beg to say: When I bought my present place, there was an acre of Washington plums grafted on plum roots on the place. On one of these trees grew a sprout which started below the union. The former owner called my attention to it, and said that he judged from the dark foliage, large leaves and immense bud shoulders that it was a promising seedling, and begged me to leave it. I did so, and was agreeably

surprised at the beautiful large, dark purple prunes it yielded." Tree a vigorous, healthy grower; leaves extra dark. Dark-purple fruit, covered with a fine light blue blush, and hanging on the tree with great tenacity, shriveling before it will fall off. The prune keeps in good condition three weeks after being picked. When ripe, the flesh is a golden green and is very aromatic; semi-freestone. It evaporates 45 pounds of cured product to 100 pounds fresh fruit. In flavor it is sweeter than the Italian, but not so sweet as the French. It bears every year, and is about ten days earlier than the Italian.

HUNGARIAN (Pond's Seedling, Grosse Prune d'Agen).—Fruit large, oval or ovate, tapering at the stem end, and oftentimes having a divided, elevated neck; skin thick and rich in color, sprinkled with brown dots and covered with a thin white bloom; stalk stout and of medium length, set in a mamelon neck; flesh yellow, coarse, juicy, quality rather poor, sweet, but not rich. Tree a strong grower and prolific bearer. Season two weeks earlier than Italian, or about the middle of September.

CHAMPION.—Large size, roundish, tapering somewhat at both ends; suture well marked; color dark purple, with reddish bloom; stalk of medium length, rather stout, and placed in cavity of medium depth; flesh firm, very juicy, parting from the stone easily; flavor much like the Italian. Tree very vigorous, healthy, and strong grower. Fruit a month earlier than the Italian. Very productive. The Champion is one of the most promising of our new prunes for shipping in the fresh state. The vigor of the trees, their productiveness, the size, beauty, quality and earliness of the fruit all recommend it.

TECHNICAL TERMS AND PHRASES.

It takes an intelligent person some time to learn the meaning of the somewhat technical phrases commonly used in the prune industry. We therefore give the definition of those most current. Some of the words defined are colloquialisms, but most of them are common to the trade.

Bleaching.—The process of changing the dark color of prunes to a lighter hue; generally accomplished by sulphuring.

Bloaters.—Prunes which, in drying, swell up to an abnormal size. The swelling is supposed to be caused by fermentation, which produces a gas. Bloaters are generally produced from large, soft, overripe prunes.

Dipping.—A process of cleansing and cutting the skin of fresh prunes preparatory to putting in the evaporator, in which the fruit is submerged in boiling lye made by using one can of concentrated lye to fifteen gallons of water. Cured prunes are also sometimes dipped in glycerine and water—one pound of glycerine to twenty gallons of water—which improves their appearance and adds to their weight and keeping qualities.

Drip.—The syrup liquid which oozes from prunes in the process of curing;

it generally characterizes a poor-prune or a poor evaporator. As a verb, the falling of the drip.

Extras.—A superior quality of prunes; generally referring to size.

Frogs.—Small, poorly developed prunes, having an abnormal shape—not a synonym of bloaters. Supposed to be caused by unripe fruit, poor soil, or any unhealthy conditions of the tree.

Grading.—Separation of prunes, either before or after curing, into uniform sizes.

Pricking.—The process of puncturing the cuticle of the fresh prune preparatory to putting it in the evaporator. Pricking is done by means of a machine, the essential part of which is a board covered with projecting needles over which the prunes must pass. A substitute for lye dipping.

Sizes.—The number of cured prunes it takes to make one pound. Those requiring from 40 to 50 prunes to weigh a pound are called 40s-50s, those requiring 50-60, 50s, 60s, etc. The four sizes are the 60s-70s, 70s-80s, 80s-90s, and 90s-100s. Commercially, it means equal quantities of these sizes. Sizes and grades are used as synonyms.

Sugaring.—The formation of globules of sugar upon the cuticle of cured prunes, rendering them syrupy and sticky, and destroying the luster of the prune.

Sulphuring.—A process cured prunes are put through to give them a lighter color. The prunes are put in a tight room, generally just as they are put on trays before being placed in the evaporator, and subjected to the fumes of burning sulphur for a half-hour. Or they may be sulphured after being taken from the evaporator.

Sweating.—A process prunes are subjected to, immediately after being taken from the evaporator, in which they are put in piles or bins with the temperature at from seventy degrees or eighty degrees, turned several times, and allowed to sweat.

Picking and Grading.—There are all sorts of prunes put upon the market. The differences are largely attributed to the care and attention given to the details of curing. Simple as it may seem, the picking of the fruit is one of the most important matters in the process of curing prunes. Half the "bad luck" attending evaporation, in which frogs, bloaters, sugared fruit and drip are produced, is caused by carelessness in picking. We put the greatest emphasis upon this, as neglect in picking is one of the commonest faults in prune making, and its betterment must be recognized as a fundamental requisite of success. I have seen men knocking the fruit from the trees with clubs, handling it with shovels, and pouring it roughly from boxes into a wagon-bed. "There is nothing in prunes," was the cry when the product was put on the market. Shortly before the picking season begins the ground under the trees should be cleared of rubbish and worthless fruit, and the soil mellowed with a steel rake. The Petite prune, and to a large extent the Italian and other varieties, when ripe enough to dry will drop to the ground; at least, no further assistance is given it in falling than a gentle shake of the tree. If the fruit shrivels a little before dropping, all the better. The object in thus letting the fruit get thoroughly ripe is, that not until then is there a maximum amount of solids and saccharine matter so desirable in a good cured prune, much drip is prevented, since there is less juice, and the essential rich flavor is not present until the fruit is ripe. . . .

Dipping vs. Pricking.—Prunes are dipped in boiling lye or pricked by needles in a pricking machine, to check and make tender the tough skin, so that the moisture can escape easily and drying be thus facilitated. Incidentally the fruit is cleansed. Both processes are in vogue, and a discussion of their relative

merits is in order. Lye dipping, as practiced in Oregon, is about as follows: One pound of concentrated lye is dissolved in from ten to fifty gallons of water, the proportion of lye and water differing greatly with the various prune growers. The primitive way is to keep the solution boiling in a large kettle, into which the prunes, placed in a wire basket or a much-perforated metal vessel, are immersed and there kept in motion, by twirling or swinging, for from thirty to sixty seconds, depending upon the condition of the fruit. A more modern way is to have the fruit run from the grader to a set of endless chains with carrying aprons, and by them carried through a pan containing the boiling lye solution, heated with submerged steam-pipes; from the lye the prunes are carried on through fresh water, preferably running water, and then spread on trays. If the operation is well done the prunes on coming to the trays should have their skins bright and shining, and present, upon close examination, a finely checked condition. Over or under immersion causes the fruit to dry unevenly; when too much scalded the skin tears and becomes ragged, and the fruit becomes soft and mushy, making a sticky, nasty mess on the trays. Pricking machines mechanically cut or perforate the skins of prunes. The fruit is fed over a shaking table that has needle points projecting above the surface, these cut and perforate the skins of the prunes. The needle table can be regulated, so that by having different slants the skins may be cut more or less, as the condition of the fruit requires. The dirt and leaves are separated by a screen, and the fruit is washed, either by having it pass through hot or cold water or by having a stream of water play on the fruit as it comes on the pricking table. The pricking machine may have grading and spreading attachments, so that the fruit from the time it is poured from boxes need not be handled until on the drying trays. Each of the two methods is championed by experienced and practical men, some of whom have tried both, and seemingly have obtained directly opposite results. We must, then, come to the conclusion that a choice between the two methods rests either upon prejudice or that there is a place for both, depending on the product desired or the fruit that is to be handled.

Final Processes.—After dipping, or pricking, the prunes are ready for the evaporating chamber. It is impossible to give detailed directions for treatment in the evaporator, since the process must vary with the character of the evaporator. The time required for drying prunes differs with various varieties, and with each variety depends much upon the circulation of air, since circulation governs the degree of heat allowable. Lye-dipped Italian prunes require from twenty-four to thirty-six hours; Petites, twelve to twenty-four hours; Silvers, thirty-six to forty-eight hours. All three varieties are cured in less time, but seldom well cured. A common fault is to hasten the process too much. A prune is well cured when it feels soft, smooth, and spongy; the pit should be loose, but should not rattle; the flesh should be yellow in color, elastic, and "meaty"; the skin should be bright and lively and free from drippings and exudations. An overcured prune is harsh and coarse, and has a dried-up appearance. In prunes not cured enough there is risk of loss through molding or fermenting. The Petite prune, well cured, is of a clean, bright, amber color; the Italian, very dark red, approaching black in color. The Silver must have a beautiful golden hue.

After the fruit is taken from the evaporator it is put in bins or piles to sweat. The sweating room is generally kept at a temperature of from seventy to eighty degrees. To facilitate the process, the fruit is occasionally turned with a scoop-shovel. The sweating is sometimes omitted, but at a risk, as fruit will often-times discolor and possibly ferment if not allowed to "go through the sweat."

Preparatory to packing, the fruit is graded to sizes, the various grades indi-

cating the number of prunes to the pound, as 30s to 40s, 40s to 50s, and so on to 110s to 120s. By some, the prunes are dipped in boiling water and glycerine, or other solutions, but such dipping is in disrepute, as indicating an undue amount of avarice to secure weight. However, intelligently done, "glossing" or "finishing" prunes may be made a valuable process.

In packing, many different methods are used. A producer will adopt whichever one, for his particular reason, or his particular market or conditions, will give him best results. Only experience can teach this. Much fruit is packed in cotton sacks, many buyers preferring it so packed, as it gives a chance for re-packing. Producers with a good product like to establish a reputation for their brands, and so pack in boxes. There is a gain in weight by this method, as the fruit does not dry out so much as in the sacks. Packing fruit is an art, and must be learned by observation. Lining with paper, filling, facing, etc., all require a little education. If the boxes are to be faced, average specimens of fruit should be flattened and neatly laid in the box, which should be upside down. Fill the box, press, nail on the bottom, invert, and brand or put on the label.

THE COMPOSITION OF THE CURED PRUNE.

Of all the methods for preserving fruit none is of so great importance to the American people as that of fruit evaporation. Of all fruits so preserved the prune certainly takes first rank. The reader must not confound the term *evaporated* fruit with that of *dried* fruit of years ago, for the newer process gives a cured product much superior to the sun- or oven-dried article, retaining, as it does, much of the original color and flavor, being soft, pliable, and palatable to eat out of hand. The process of evaporation has for its object primarily to drive off a sufficient amount of moisture to make the fruit keep, and to do this in such a manner as to leave the fruit in the condition above described, and leave the flesh of a transparent appearance—a clear yellow in the case of the French prune, and an amber in the case of the Italian. No prune which has not these characteristics has been properly cured. It is not possible at this time to go into the technique of fruit curing, but rather to state the results of the analyses of samples of fruits cured by this method, as they are found on the market. The composition of the prune may be expressed as follows:

Fruit	{	1. Juice	{	Water.	{	Sugar.	
				Soluble solids. . . .		Pectin.	
		2. Pulp. . . .	{	Cellulose.		{	Albuminoids.
				Carbohydrates.			Acids.
		Pectose.					

During the process of ripening the first division is increased much at the expense of the second.

"PASS THE PRUNES."

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